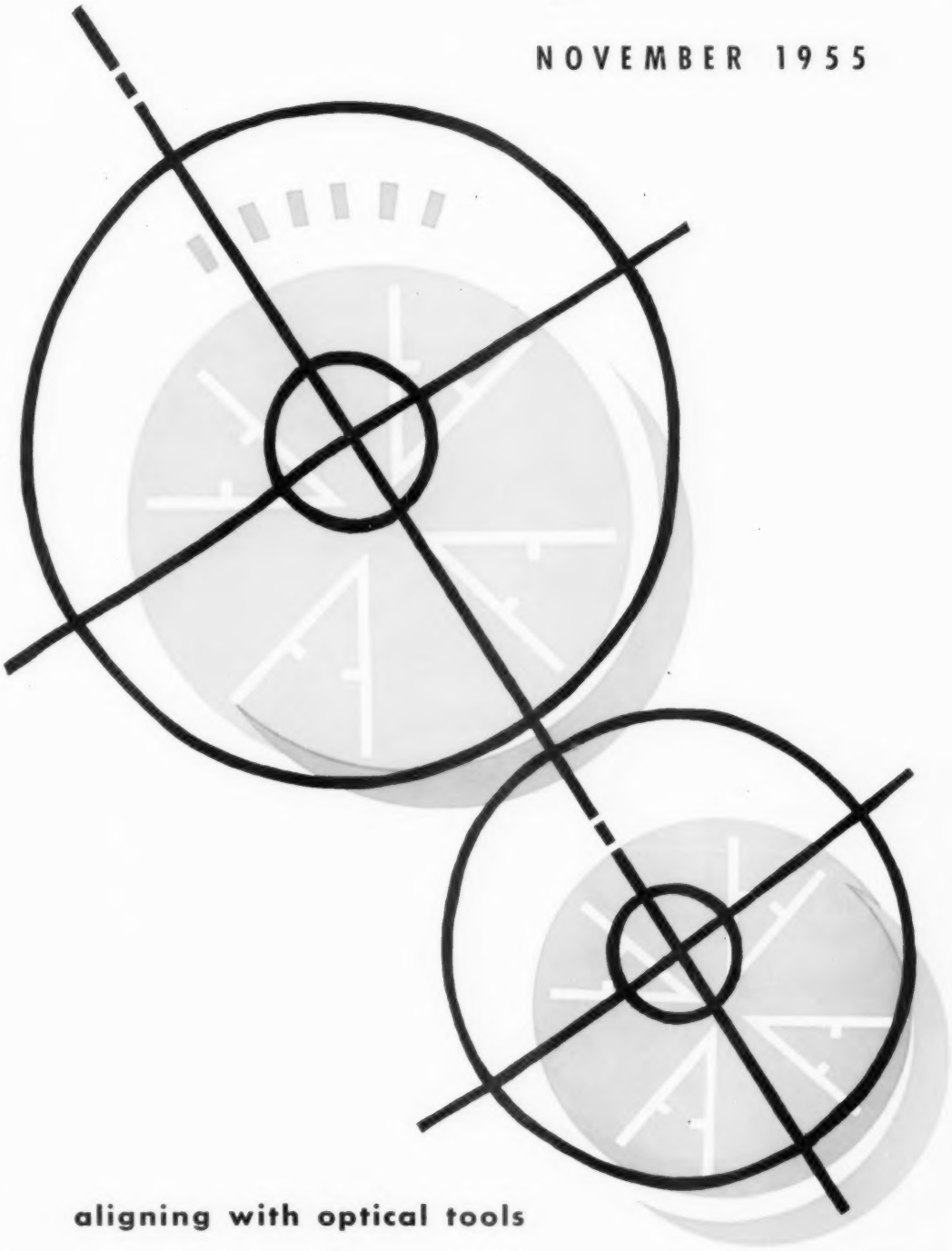
the Tool Engineer

NOVEMBER 1955

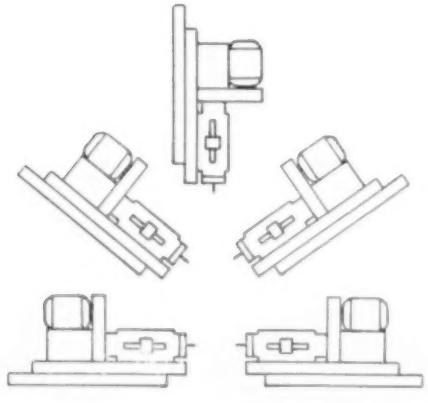


aligning with optical tools

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

HEALD SLIDE UNIT BORE-MATICS

approach any borizing problem
from the **RIGHT ANGLE**



Slide Units can be easily arranged to approach the work from any desired angle. Multiple stations can be combined on a single base with identical or consecutive operations at each station, for maximum production efficiency.

With the new line of Heald Slide Unit Bore-Matics, the machine can be adapted to the work—not the work to the machine. For these compact, hydraulically operated Slide Units, complete with boringhead and drive, can be arranged to approach the work from any desired angle—vertically, horizontally, or at any inclination best suited to the operations being performed and the nature of the work. That means greater adaptability to your specific job requirements. It means more efficient floor-to-floor cycles and higher production per machine-hour.

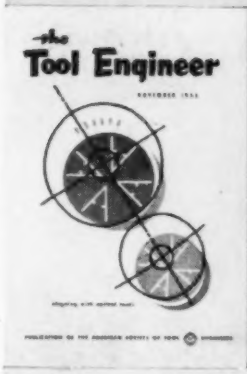
The two-station Vertical shown above is a typical example of modern Slide Unit design—boring, facing and chamfering aluminum torque converter housings at 88 parts per hour, gross. For the newest developments in precision finishing, IT PAYS TO COME TO HEALD.

THE HEALD MACHINE COMPANY
Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD ®

Send for Bulletin 2-25-T

Cover: Principles of optical tooling are illustrated showing use of an autocollimator and targets for aligning machine elements. Alignment of a lathe bed is employed to illustrate practical application of the method in the article beginning on page 75.



The Tool Engineer

Volume XXXV, No. 5 November 1955

TECHNICAL ARTICLES

It Can Still Happen Here! . . . . . By Harry B. Osborn, Jr. 73
Optical Trueing of Lathes Saves Time . . . . . By Earle B. Brown 75
Gadgets 79
Meeting Milling Requirements under Shop Conditions . . By A. O. Schmidt 82
How To Fabricate Plastic-Faced Dies . . . . . By Walter A. Hockett 87
Honing Techniques Control Size . . . . . By Glen M. Calvert 91
Hidden-Arc Welding Speeds Production . . . . By Charles N. Aronson 95
Tools at Work 98
Practical Methods of Introducing Quality Control . By Thomas J. Bizzoco 102
Economical Tooling Gives Short Run Plastic Parts . . By C. E. Herington 105
Drill Jigs from Standard Structural Shapes . . . By Arthur J. Stockwell 107
Correct Die Shank Location . . . . . By Federico Strasser 110
Tool Costs Reduced Through Use of Hollow Stock 114
Work Sampling Gives Better Time Study Allowances . . By B. W. Niebel 115
Automatic Hot-Test Stands at Plymouth Engine Plant . By Robert A. Wason 117
Tempering Chart for Steels (Reference Sheet) 125

ASTE NEWS

Featured This Month (Index) 127
Operation Chapter Bulletin . . . . . By Edith R. Saunders 129
Monmouth Chapter Chartered 134
The California Story . . . . . By Paul B. Slater 135
Exposition Stickers Ready 136
San Jose State College Conference Program 136

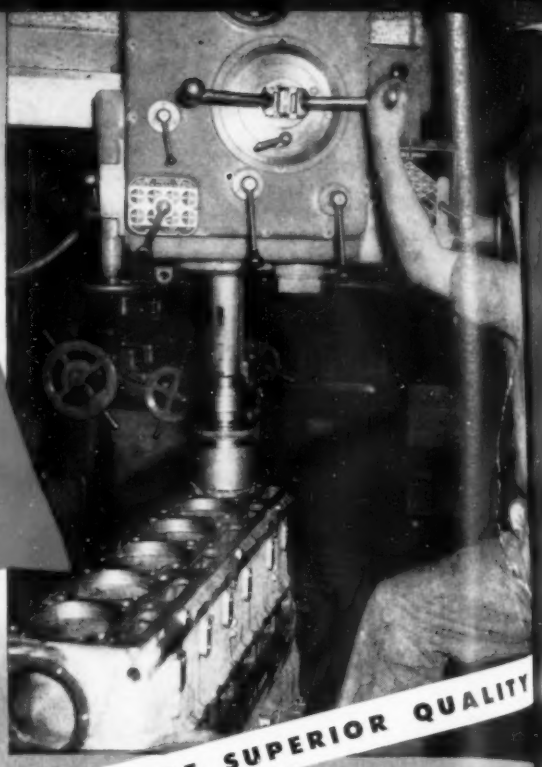
DEPARTMENTS

Abstracts of Foreign Literature 189
Field Notes 193
Letter from the Editor 3
Men at Work 181
Progress in Production 147
Readers' Viewpoints 176
Technical Digests 199
Technical Shorts 197
Tools of Today 151
Trade Literature 183
Who's Meeting—and Where 178
Advertisers' Index 314

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

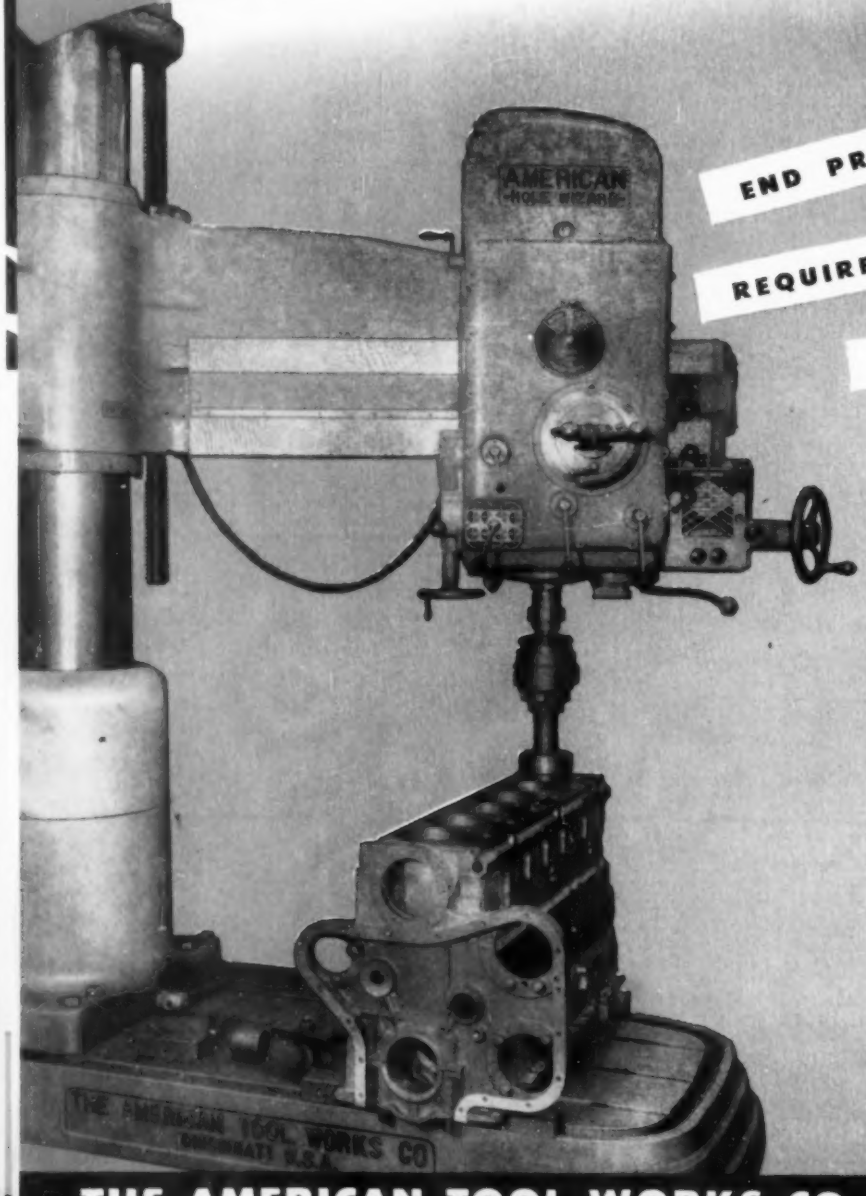
The 2 are inseparable—



END PRODUCTS OF SUPERIOR QUALITY

REQUIRE SUPER QUALITY EQUIPMENT

TO PRODUCE THEM . . .



For six years this "AMERICAN" Hole Wizard Radial has been counterboring "Cummins" Diesel Engine Blocks and holding the required depth tolerance of .001″ in the 6.125″ counterbores. Furthermore, the operator testifies to the fact that the machine is convenient and easy to operate and maintenance has been negligible.

The quality of "Cummins" products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

ry E. Conrad
Executive Secretary

an Ray Putnam
Publishing Manager

Editorial

hn W. Greve
Editor

obert A. Wason
Associate Editor

alph H. Eshelman
Associate Editor

rthur Colton
Assistant Editor

Dorothy J. Taylor
Assistant Editor

Nancy M. Houston
News Editor

Edith R. Saunders
Assistant News Editor

Michael Babala
Art Editor

Business

Michael Jakesy
Business Manager

Clarence T. Etter
Advertising Manager
10700 Puritan Ave.
Detroit 38, Mich.

Austin G. Cragg
Eastern Advertising Mgr.
400 Madison Ave.
New York 17, N. Y.

Richard E. Cleary
Ohio Advertising Mgr.
15515 Detroit Ave.
Cleveland 7, Ohio

Stanley F. Girard
Western Advertising Mgr.
540 North Michigan Ave.
Chicago 11, Ill.

Robert E. Ahrensdorf
Pacific Coast Adv. Mgr.
1140 Wilshire Blvd.
Los Angeles 17, Calif.

Fay H. LaRoue
Circulation Manager

THE TOOL ENGINEER

Executive & Editorial Offices:
10700 Puritan Ave.
Detroit 38, Mich.

Publication Office:
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscriptions: members, $2.00; nonmembers, $6.00; Canada, $6.50, and all other countries, $8.00. Copyright 1955 by the American Society of Tool Engineers.

The Tool Engineer

Can We Be Prepared?

Much has been said about radio interference emanating from industrial plants and the urgent need for suppressing it. In fact, during an emergency involving military operations, communications could be impaired. This would necessitate shutting down industrial operations, possibly at a time when production would be most urgent. This could easily happen to a plant adjacent to an air field.

Apparently, the problem has been regarded as so terrifically big that little has been done to solve it. On the other hand, it may be that those responsible are not sufficiently aware of its implications. Whatever the reason, the results are the same. Equipment and machines are still being built and installed that are not interference free. Yet the suppression of radio interference from machines generally need not be overly expensive or involved if provided in the design stages.

Sources of interference may include electrical components such as motors, rectifiers, contactors, relays, circuit breakers pushbuttons and limit switches. Additional sources of interference include V-belts, bearings, friction clutches and other components which generate static charges. Any component that cannot be designed to be interference free can be shielded or suppressed by use of filters.

Practical requirements for tolerance of interference should be determined without delay, especially in those areas where military communications could be critical. When these are spelled out, tool engineers can be depended upon to solve the problems of suppressing existing equipment and to make sure that new equipment will be interference free.

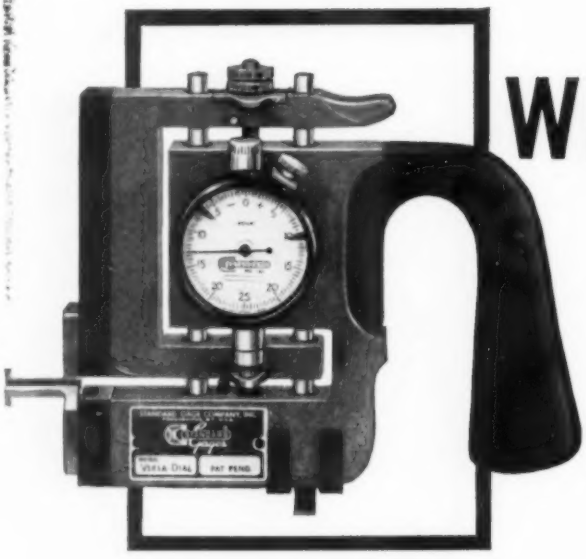
Certainly, the problems are not insurmountable and we might be glad some day that we have paid attention to this detail. It would be a sad story if manufacturing operations had to cease during an emergency so that the military may function.

John W Greve

EDITOR

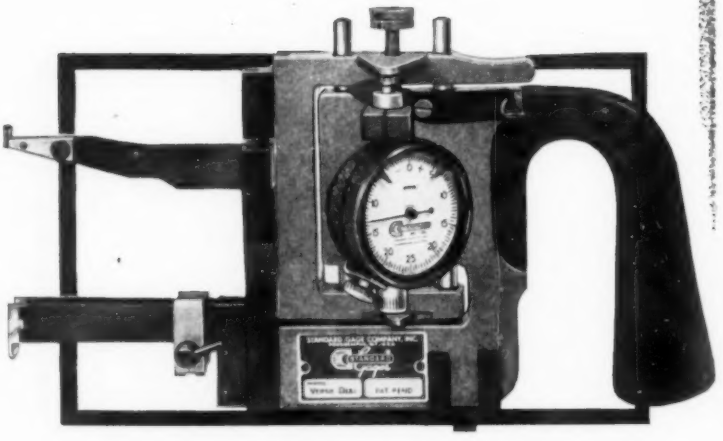
MEASURE I. D. GROOVES

FROM .375″ TO 8″ AND MORE



WITH THE SAME BASIC UNIT!

TYPE shown above for grooves down to .375″.



THREE SIZES of type shown at right measure from .625″ to 8″ and more. These are equipped with adjustable backstops, which automatically locate the groove for more rapid checking. Steel or tungsten carbide tips are removable and can be furnished to various specifications.

THESE INTERNAL groove gages are built around Standard's recently developed Versa-Dial, a multi-purpose dial unit capable of a large variety of both internal and external gaging applications, including threads, gears, counterbores, shallow diameters, etc. Write for details.

STANDARD GAGE COMPANY, INC.

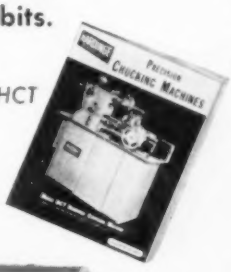
51 PARKER AVENUE STANDARD® **POUGHKEEPSIE, N. Y.**

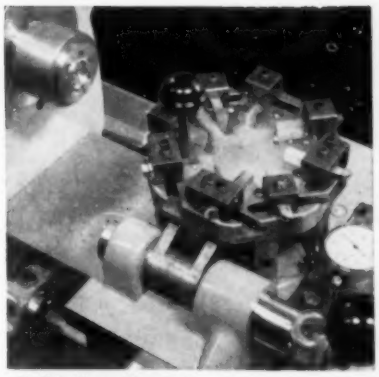
HARDINGE
ELMIRA, N.Y.

PRODUCTION
With Tool Room Accuracy

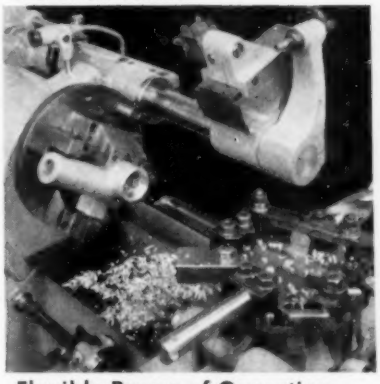
Hardinge Precision Chucking Machine HCT finish diameters, recesses, shoulders, back faces, front faces, and cuts precision threads *in one setting — all concentric* with each other. Tooled inexpensively with standard tool bits.

For complete information write for Bulletin HCT

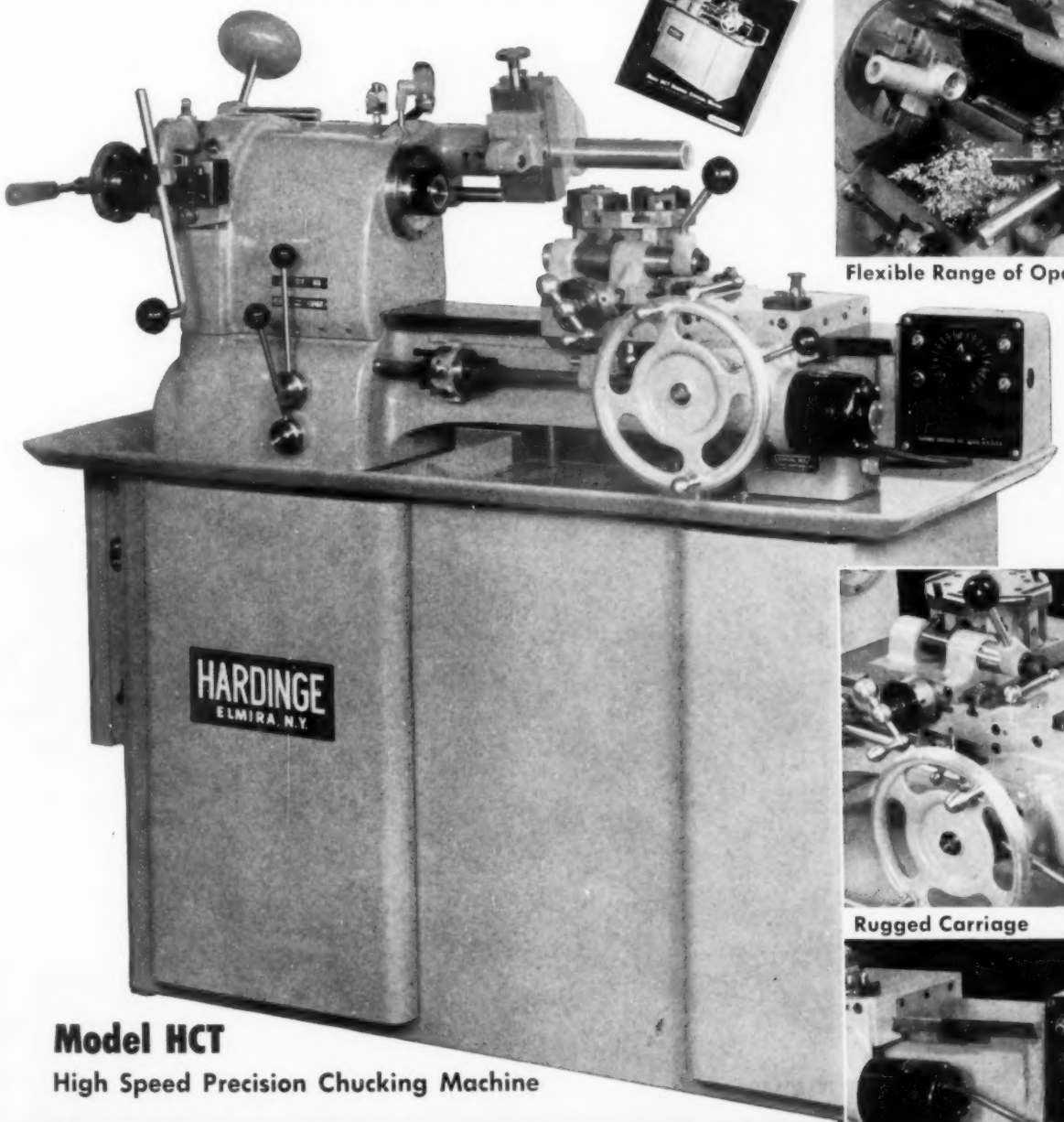




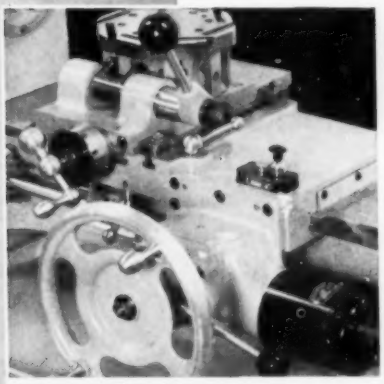
8-Station Turret



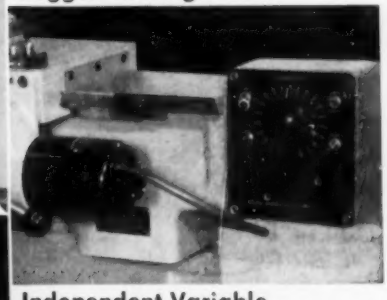
Flexible Range of Operation



Model HCT
High Speed Precision Chucking Machine



Rugged Carriage



Independent Variable Carriage Feed

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Offices in Principal Cities. Export Office—269 Lafayette St., New York 12, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-5

Available

from Winter distributors located in principal cities:

BALANCED *Action*

TAPS

Hand Taps
Machine Screw Taps
Chip Driver Taps
Nut Taps
Pipe Taps
Pulley Taps
Nib Taps
and various types of Taps for Special Applications

GAGES

A complete line of Plug and Ring Gages, Threaded and Plain.

DIES

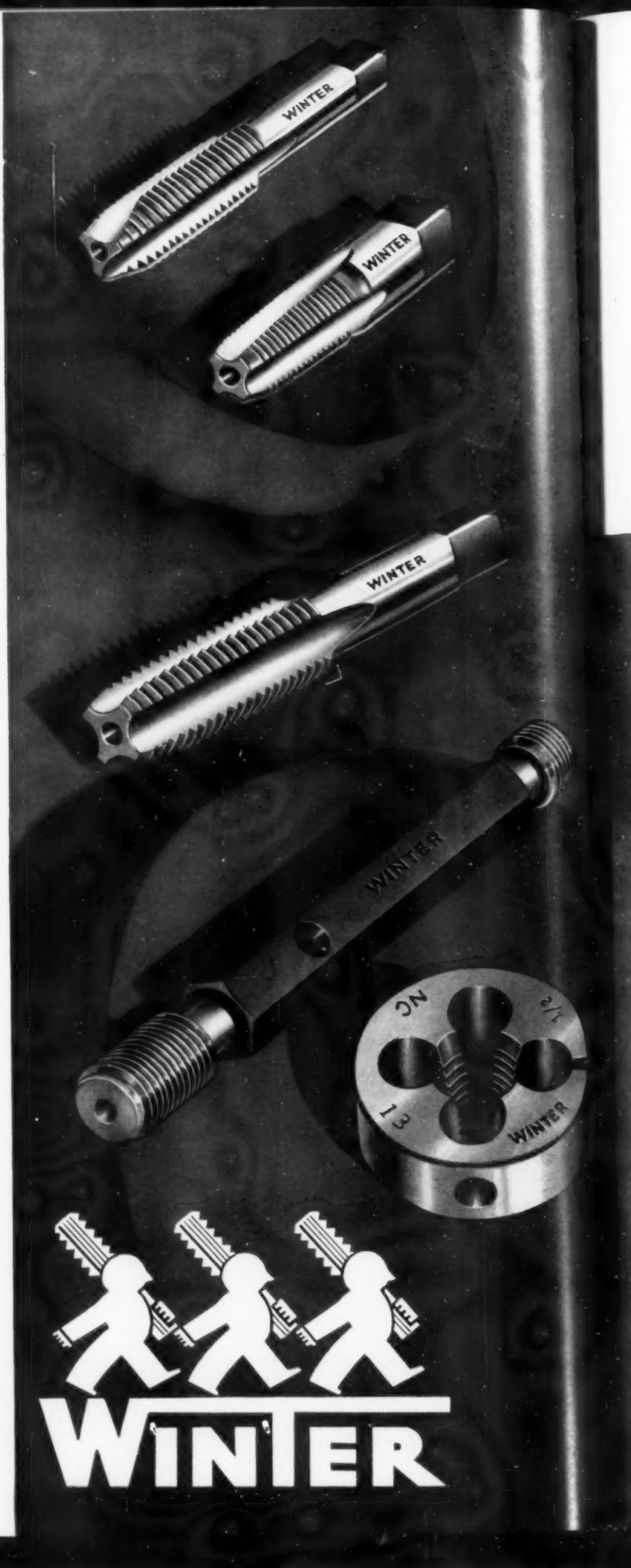
Adjustable Round Split Dies
Hexagon Rethreading Dies
Solid Square Bolt Dies
Solid Square Pipe Thread Dies

PHONE
YOUR WINTER
DISTRIBUTOR

WINTER BROTHERS COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Branches in New York • Detroit Cleveland • Chicago • Dallas • San Francisco Los Angeles

Division of National Twist Drill & Tool Co.



WITH *Dependable* CUTTING EDGES . . .

National milling cutters and hobs, with their dependable cutting edges, are available from Factory and Distributor's stocks. They give you cutting edges for excellent production and long wear.

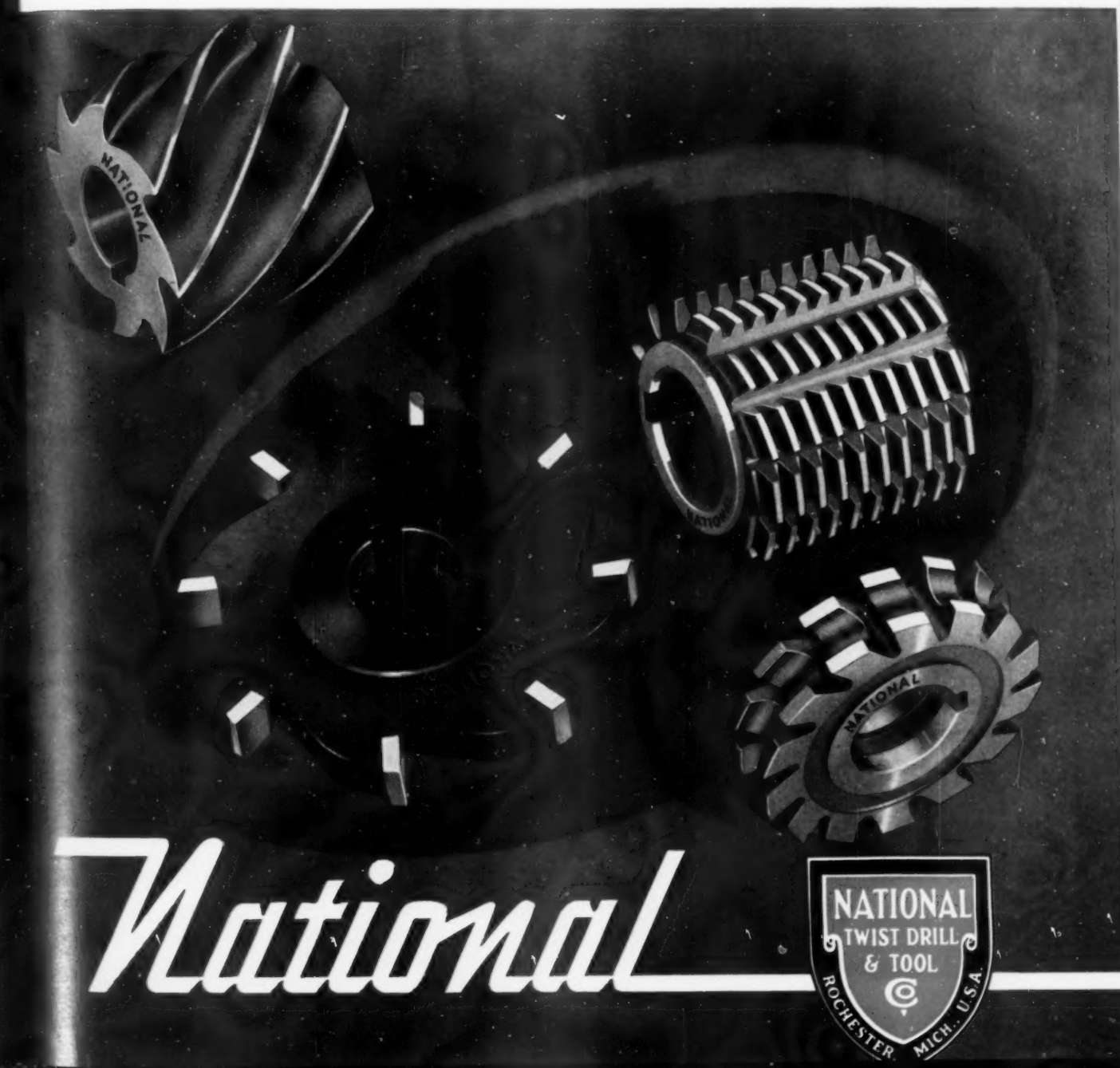
Milling cutters also available with carbide tips.

PHONE YOUR NATIONAL DISTRIBUTOR

NATIONAL TWIST DRILL AND TOOL COMPANY Rochester, Michigan, U.S.A.

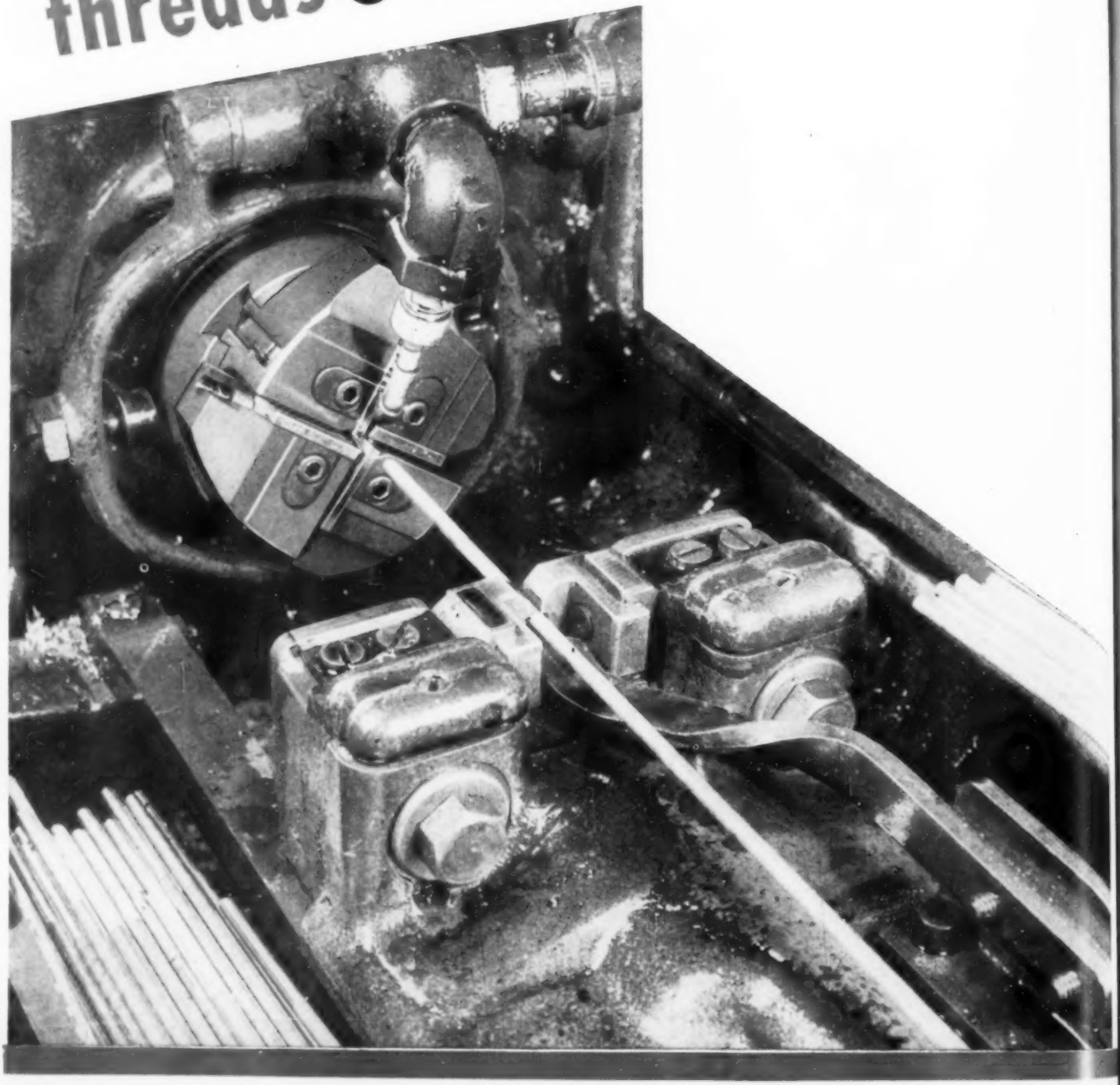
Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

Twist Drills • Reamers • Counterbores • Milling Cutters • End Mills • Hobs • Carbide Tipped and Special Tools



3/8" Machine

threads 500 pieces per hou



THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT

A LANDIS 3/8" Threading Machine has increased the output of threaded automobile seat lock rods by 25%.

#10 24-pitch UN threads are cut 1¾" long on 54" galvanized wire rods. Production now averages about 500 pieces per hour, with 4,500 pieces threaded between grinds of the chasers. With excellent production between chaser grinds, low tool cost and minimum downtime are assured through the use of long-life LANDIS Tangential Chasers which can be reground for 80% of their original length.

These savings are being realized at Mid-West Wire Products in Detroit, Michigan. Best previous threading methods never produced more than 400 pieces per hour, and completed only 2,500 pieces before requiring the chasers to be reground.

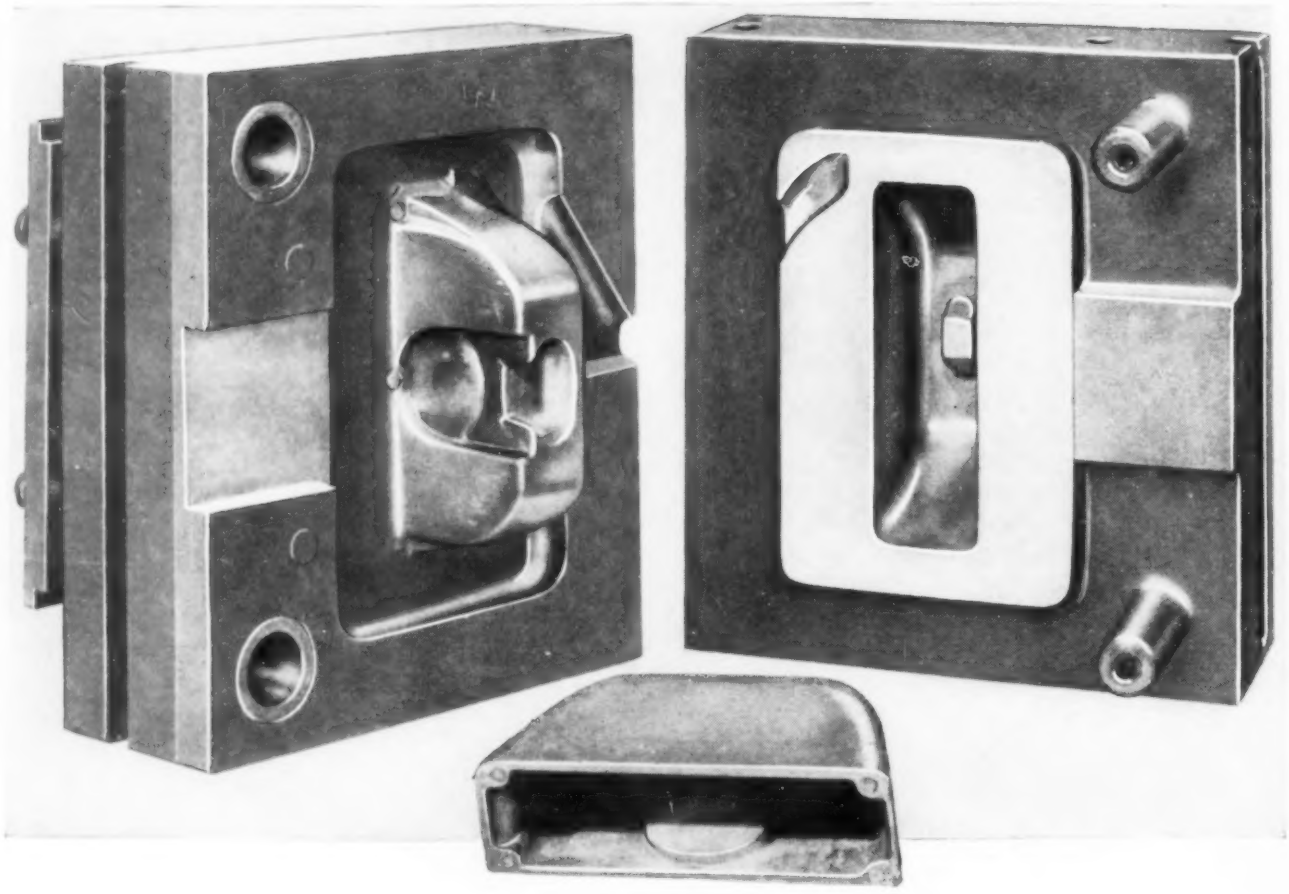
The 3/8" Machine is a small high-speed machine for threading small parts (3/16" to 1/2" in diameter) to precision tolerances. This machine has been designed so that it can be operated with only one hand, freeing the other hand for loading and unloading the workpiece. The opening and closing of the grips is automatically controlled by the carriage operating lever, and the die head automatically opens on completion of the thread and closes during the carriage return.

Analyze the threading operations in your plant today for the possibility of a similar production saving. Then send us the specifications of the workpiece involved, and ask for Bulletin H-91 for more detailed information about the LANDIS 3/8" High Speed Threading Machine.

LANDIS Machine COMPANY
WAYNESBORO
PENNA., U.S.A.

282-2-C

CUTTING - TAPPING - GRINDING - ROLLING



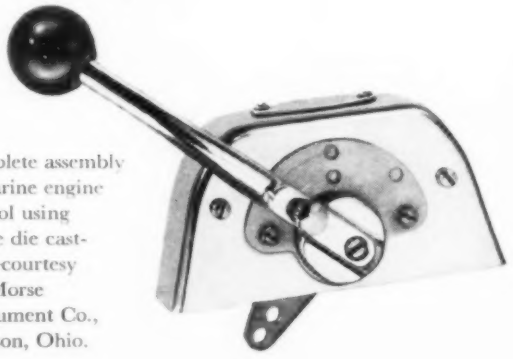
CUT DIE COSTS . . . WITH UDDEHOLM TOOL STEEL

If you are a user of steel dies for brass or aluminum die casting, you will be interested in the experience of one of our customers—the Accurate Die Casting Co., Cleveland, Ohio.

Faced with the problem of die casting a brass piece (shown above) weighing almost two pounds, they consulted with their local Uddeholm representative, who recommended Uddeholm's new, exclusive die steel—UHB-X1. Placed on trial with dies made from a competitive steel, the UHB-X1 dies lasted many times as long, and required no redressing! ! !

Furthermore, in spite of an injection temperature of 1800°F., the *uncooled* UHB-X1 dies showed absolutely no sign of heat checking. These dies have a high hot hardness over an extended period of time, as well as uniform hardness throughout the cross sections.

If you would be interested in further details on our UHB-X1, or any of our other quality tool steels for high or low temperature die casting, please get in touch with us, and we will be happy to go over your requirements.



Complete assembly of marine engine control using above die casting—courtesy the Morse Instrument Co., Hudson, Ohio.

UHB

UDDEHOLM COMPANY OF AMERICA, INC.

Tool and Die Steels
Specialty Strip Steels

Offices and Warehouses

New York: 155 East 44th Street, MUrray Hill 7-4575
Cleveland: 4540 East 71st Street, Dlamond 1-1110
Los Angeles: 5037 Telegraph Road, ANgelus 2-5121

District Representatives

CHICAGO: Frank J. Mackin, Leroy E. Marshall, 55 East Washington, STate 2-1649
DETROIT: Warren H. Nugent, 17304 Lahser Road, KEnwood 5-6340

In Canada: Uddeholm (Canada) Ltd.
35 Coronet Road, Toronto 18, BElmont 3-3235

POPE PRECISION SPINDLE

means finer finishes at lower cost

Look at the super precision double row cylindrical roller bearings and separate thrust bearings, an exclusive feature found only in Pope Spindles.

You won't find bearings like these in other makes of spindles.

The bearings and shafts in Pope Spindles have tremendous load carrying capacity for crush dressing and form grinding. They produce superior, low micro-inch finishes, and assure long, trouble-free operation. There can be *no endwise movement of shafts in either direction.* Operation is always cool. Pope System lubrication is good for the life of the bearings.

YOU CAN SPECIFY POPE SPINDLES WITH CONFIDENCE

Write for Catalog 60A covering the complete range from 1 HP to 15 HP in standard Pope Spindles.

106

Specify **POPE**® PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS

BUILDERS OF THE REVOLUTIONARY NEW POPE SUPER-PRECISION BORING MACHINE THAT BORES HOLES ROUND WITHIN MILLIONTHS OF AN INCH

do your operators have this

Time Saver

to help cut machining costs on stub boring operations?

SET No. 11 ILLUSTRATED
WEIGHT 350 POUNDS

SUPER MICROMETER-ADJUSTABLE STUB BORING TOOL SETS

— 1¼ to 8″ Bore Range in 7 Tools
— Eliminate "cut and try" boring
— Precision adjustment to .0001″
— Reduce setup and tool changes

Your operators always have the right tooling answer at their fingertips—for cutting costs and improving accuracy on non-repetitive boring—when you provide them with Davis Stub Boring Tool Sets. Then time lost at the tool crib is ended. For without once leaving their machines, they can bore from 1¼ to 8 inches, pencil bore from ⅜ to 1¼ inches and do light, extended boring up to 13 inches.

Highest precision and fine finish are assured by Davis Super Micrometer-Adjustable mechanisms used in all seven basic tools in each set. It provides a wide range of cutter adjustments to limits of .0001″ by simply setting the micrometer screw's dial head at the desired reading. Exceptionally rugged construction makes Davis tool sets ideal for either rough or finish boring operations. Learn how this modern tooling idea can save money in your shop.

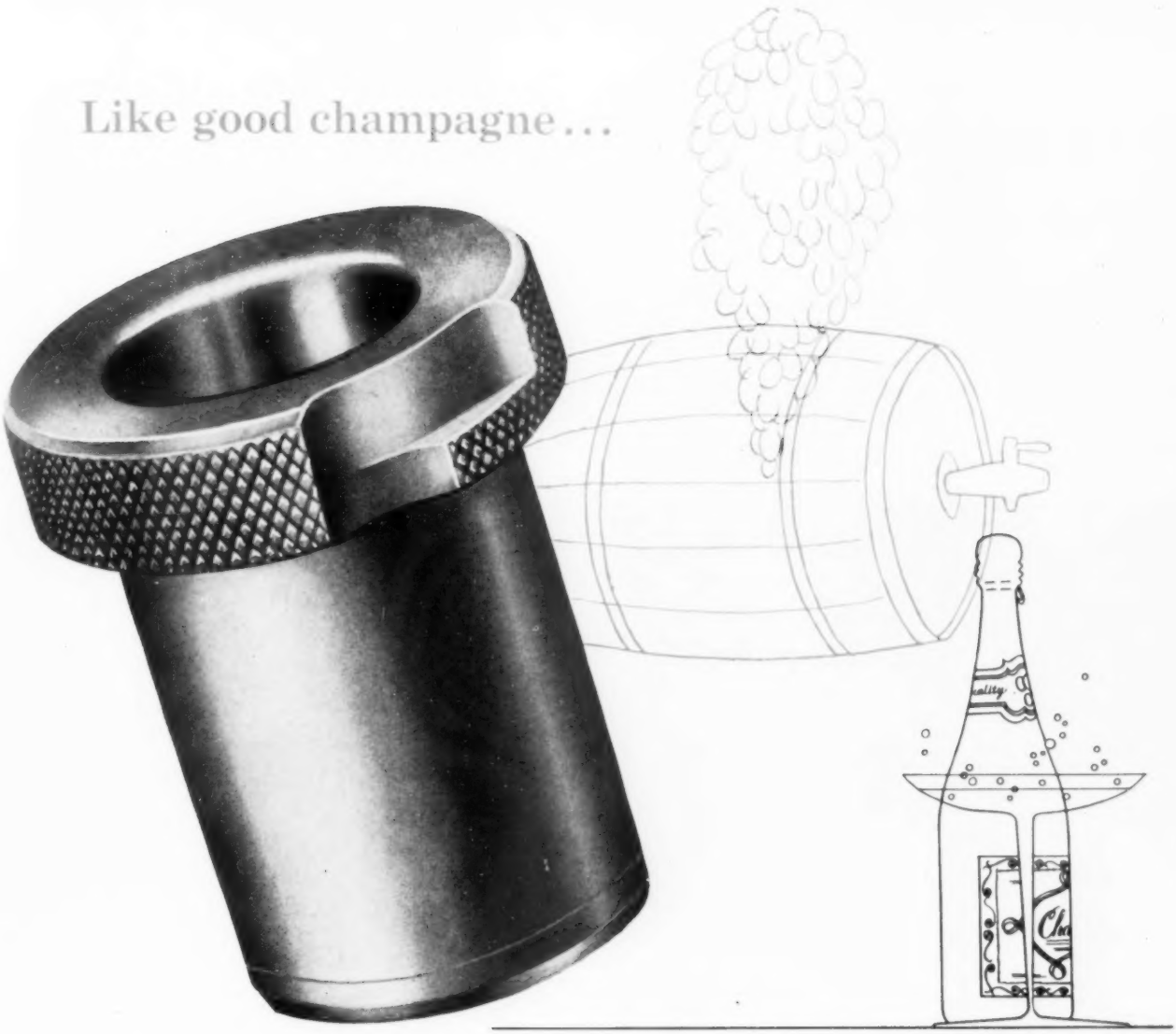
Write today for Davis Bulletin DB-50.

10 DIFFERENT STANDARD SETS AND MANY MODIFICATIONS READILY AVAILABLE

DAVIS

BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wisconsin

Like good champagne...



American ***drill bushings are meticulously made***

To assure you of the finest precision drill jig bushings, American uses the best materials obtainable, highly skilled personnel, and the most modern equipment. Each drill bushing produced must meet rigid requirements for accuracy by the latest testing devices. Then through American's outstanding distribution methods, the finest drill bushings are made immediately available in your locality.

For precision, longer wearing drill bushings with extra features as standard equipment—demand American.

SEND TODAY FOR FREE CATALOGS AND NAME OF DISTRIBUTOR NEAREST YOU•••

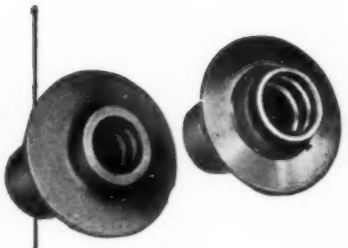
American

DRILL BUSHING CO.

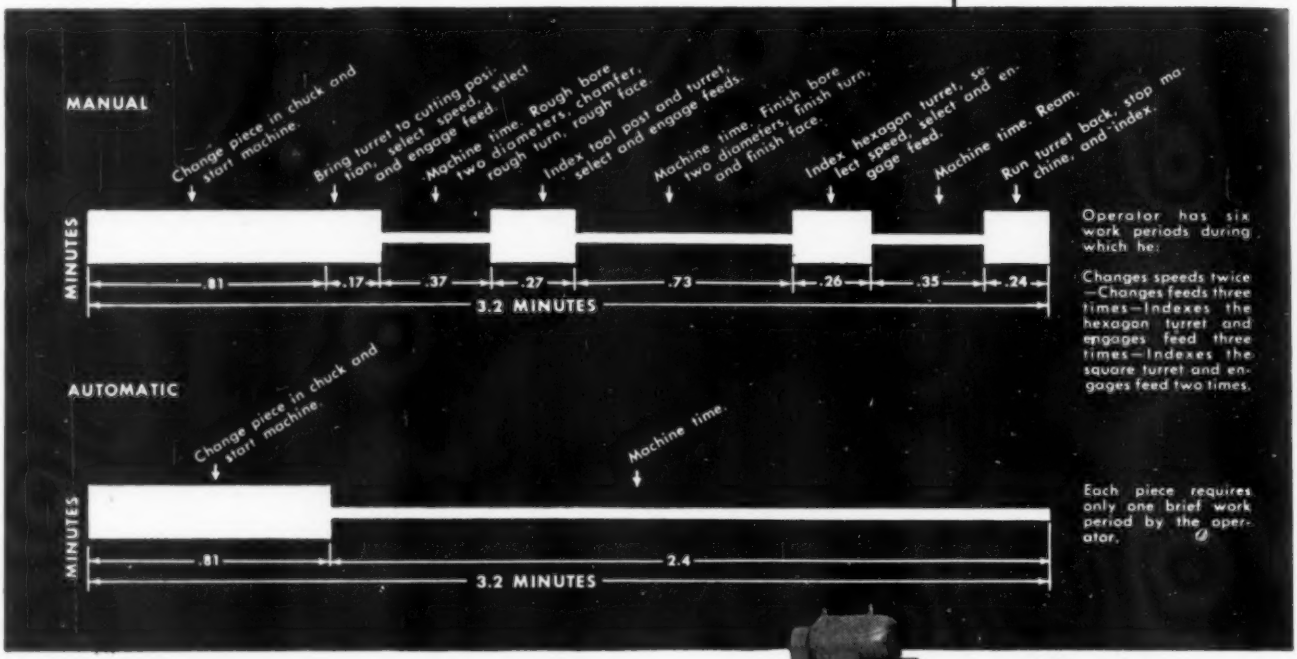
5107 PACIFIC BOULEVARD
LOS ANGELES 58, CALIFORNIA

SPECIALIZING ONLY IN DRILL JIG BUSHINGS

how the
GISHOLT FASTERMATIC
saves man-minutes and money!



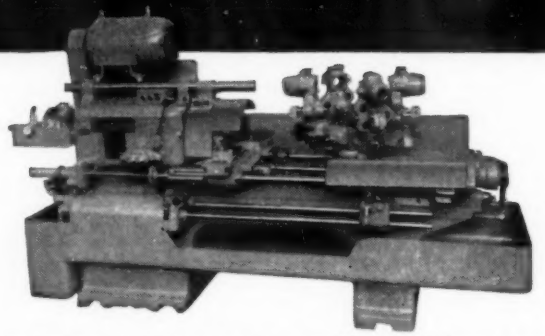
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position, select speed, and engage feed.
Machine time. Rough bore two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn, and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice —Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

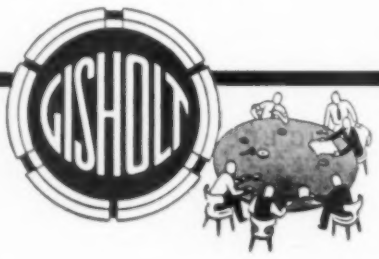
In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.

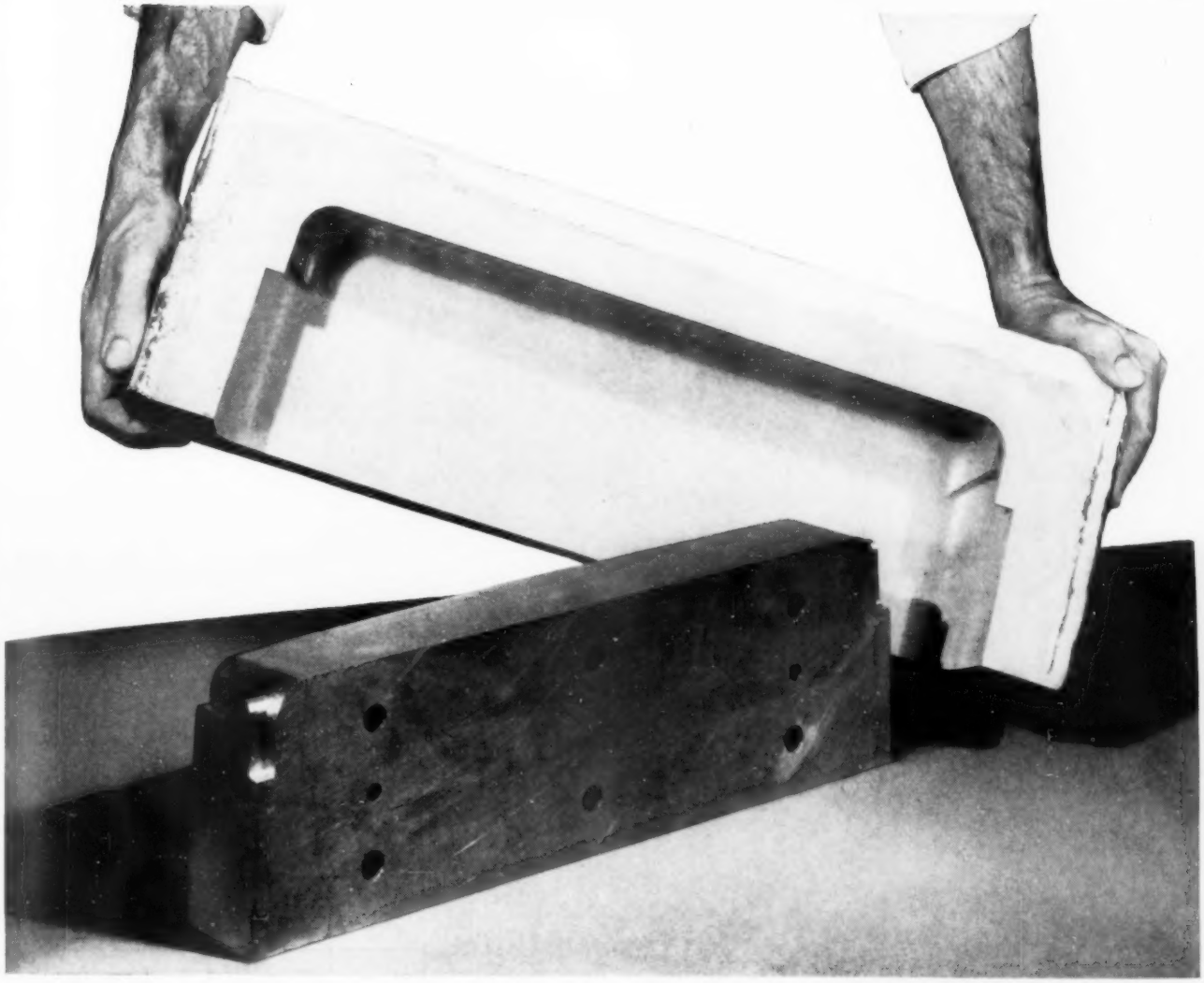


THE GISHOLT 1-F FASTERMATIC—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*



"Rezolin" Toolplastik Compound forms the concave die model shown here with the machined aluminum model around which it was cast. A "Keller" duplicator will be used to reproduce the plastic model in steel. This method saves five days, with an estimated 25 per cent reduction in production costs. Based on BAKELITE Epoxy Resins, this tooling compound is produced by **Rezolin, Inc., Los Angeles 25, Calif.**

Cast epoxy "Keller" Model shapes up 25% saving

Savings in toolmaking time often reach impressive percentages when compounds based on BAKELITE Brand Epoxy Resins are used. Here are some of the reasons:

- **Liquid compounds—can be cast to shape without pressure**
- **Cured at room temperature—no applied heat**
- **Minimum shrinkage—minimum finishing**
- **Excellent flexural, compression, and impact strength**
- **Outstanding dimensional stability**
- **Light weight means easy handling**
- **Laminated with glass cloth to form jigs, spotting racks, fixtures, and "Keller" models.**

For further information, write Dept. LO-181.

BAKELITE
BRAND
Epoxy Resins for Tooling

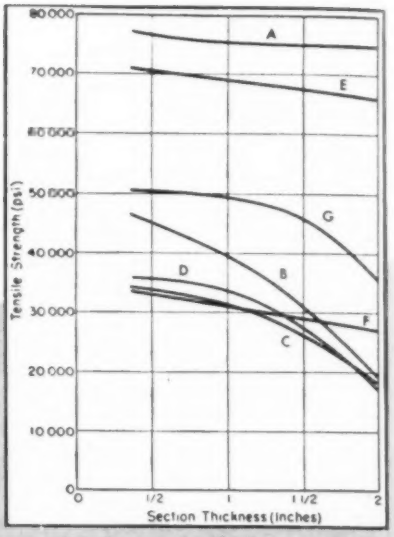
BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

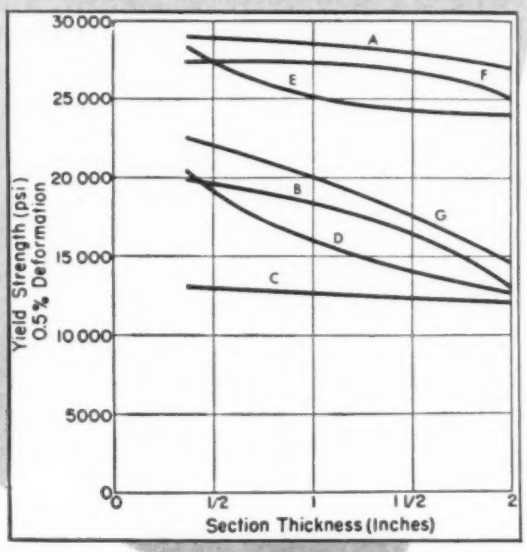
Here's proof....

that you can use lighter sections, have greater strength, improve your product, save money

with AMPCO* Metal



Tensile strengths of various non-ferrous metals vs. section thickness



Yield strengths of various non-ferrous metals vs. section thickness

Examine these charts carefully — they tell a story that can save you money and put extra life and dependability into your product.

Look, for instance, how other non-ferrous metals show a sharp decrease in mechanical values as casting cross-sections increase. Ampco remains practically constant — you require less metal.

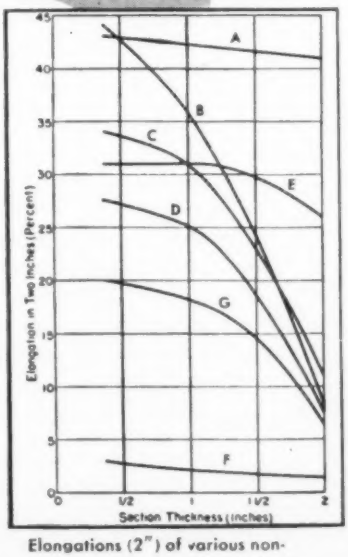
Note Ampco's unusually high tensile and yield strengths compared with conventional bronzes — you use lighter sections to do a better job. And Ampco Metal weighs 10 to 15 percent less than other bronzes — so you can make important weight reductions

Fact is, Ampco Metal's high strength-to-weight ratios can mean real savings for you — savings in material and money. Consult your nearby Ampco field engineer for full information or write us.

CHART REFERENCE

- A. Ampco Metal
- B. Tin Bronze (88-8-4)
- C. Red Brass
- D. Tin Bronze (85-5-5-5)
- E. Manganese Bronze
- F. Aluminum Alloy
- G. Silicon Bronze

Charts courtesy Materials & Methods and Westinghouse Electric Corp



Elongations (2") of various non-ferrous metals vs section thickness

AMPCO®

Sole Producer of Genuine Ampco Metal

AMPCO METAL, INC.

Dept. TE-11, Milwaukee 46, Wisconsin

West Coast Plant BURBANK, CALIFORNIA

*Reg U S Pat Off

D-43

SNYDER TOOL and ENGINEERING COMPANY

As a fitting climax to our thirtie
year, we are happy to announc
sions which will add about o
machine shop and assembly f
which will enable us to add t
machining equipment and acco

As a fitting climax to our thirtieth anniversary year, we are happy to announce plant expansions which will add about one third to our machine shop and assembly floor areas and which will enable us to add to our precision machining equipment and accommodate more manpower. We are happy, too, to take this opportunity to thank all our friends who have made this modern plant possible—our customers, our suppliers and all of the hundreds of members of the Snyder family of workers, here and throughout the country.

SNYDER SEGME

AUTOMATION in 9

182 operation, in-line transfer

features four segments wh

operate independently or as

assure continuous production

motive automatic transmission

100 cases an hour at 80% e

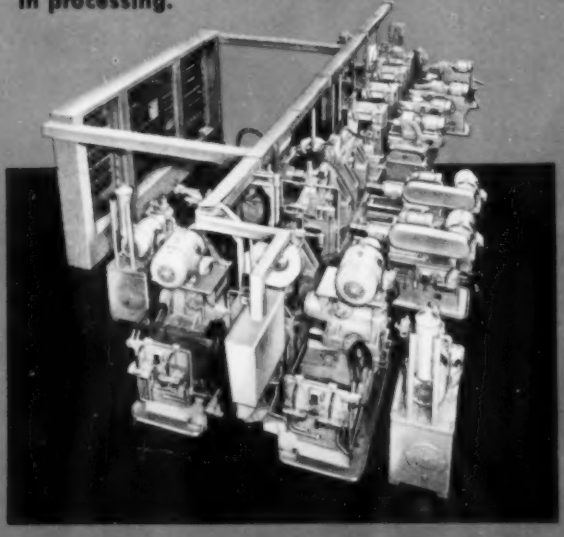
SNYDE

TOOL & ENGINEERING COMPA

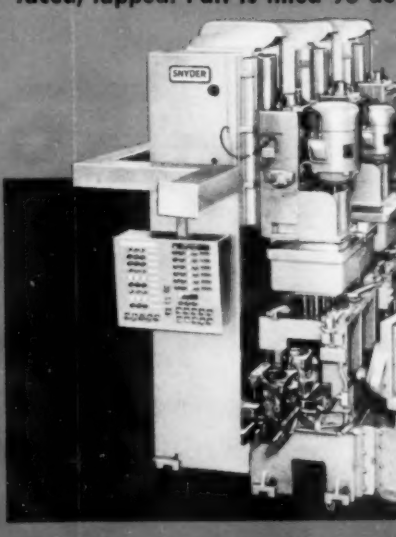
3400 E. LAFAYETTE, DETROIT 7, MICHI

30 Years of Successful Cooperation with Leading Au

SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.



SEGMENT 2: 47 feet long, 31 sta face, end and at angular locati drilled, countersunk, semi-finish faced, tapped. Part is tilted 90 de



ENTED

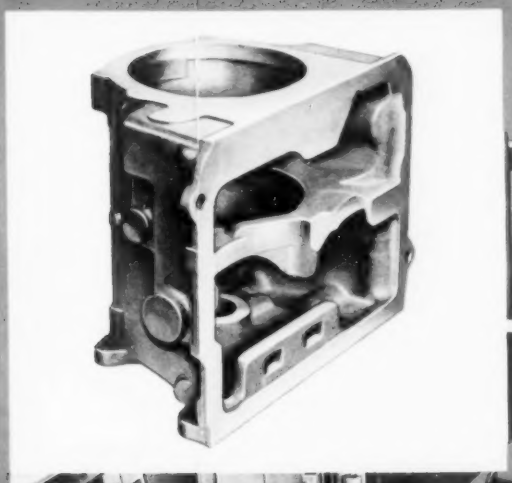
91 station,
er machine
which can
s a unit to
n of auto-
on cases at
efficiency

R

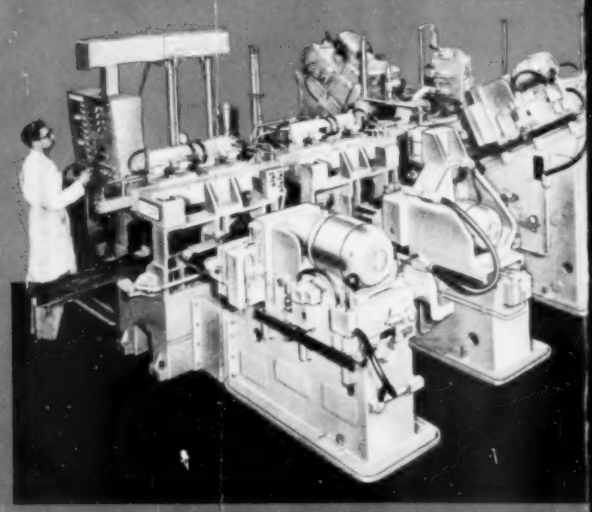
PANY
CHIGAN

American Industries

l stations, 91 spindles. In top
ocations inside, 51 holes are
nish and finish reamed, spot-
0 degrees and rotated.



SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.



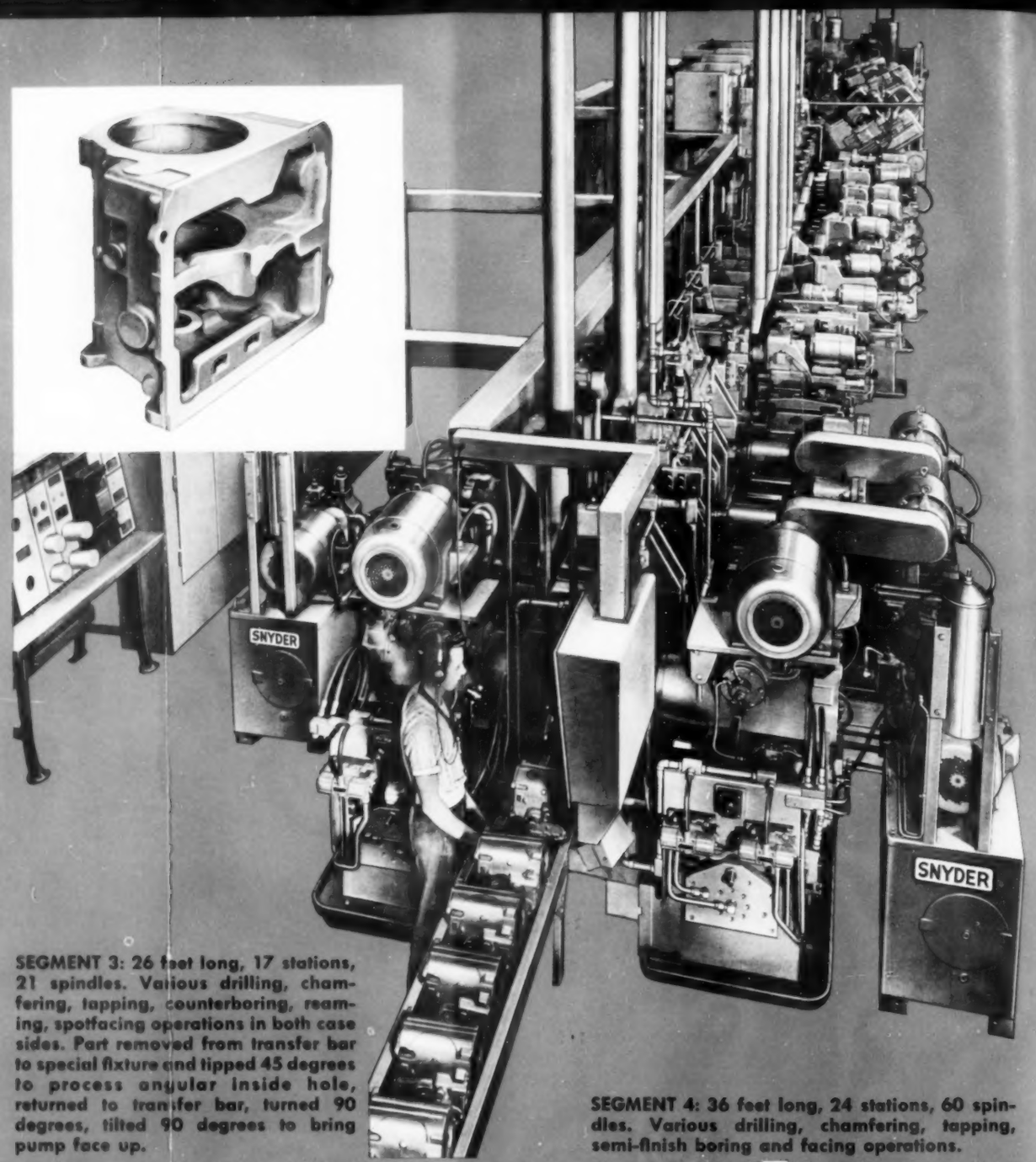
MENTED

in 91 station,
nsfer machine
s which can
as a unit to
tion of auto-
ssion cases at
% efficiency

ER

OMPANY
MICHIGAN

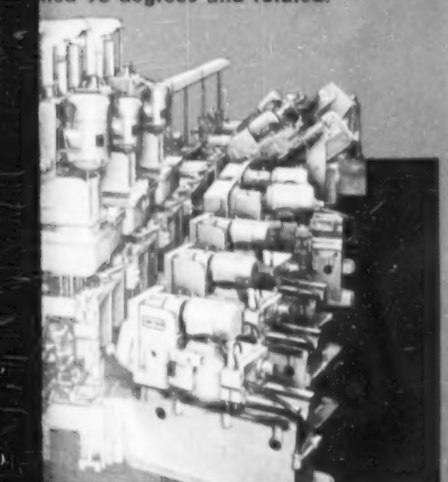
ing American Industries

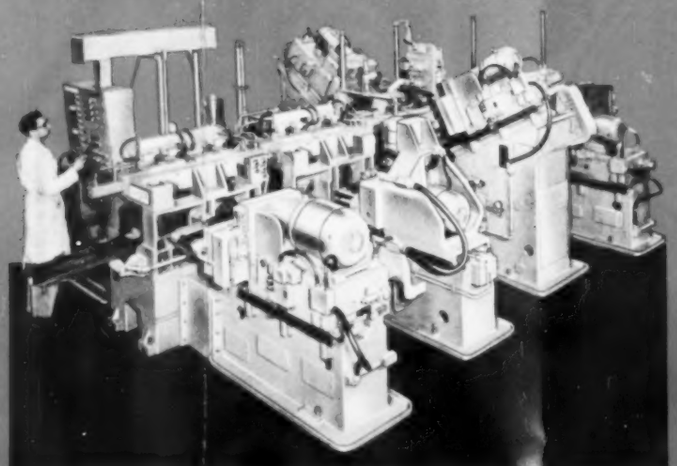


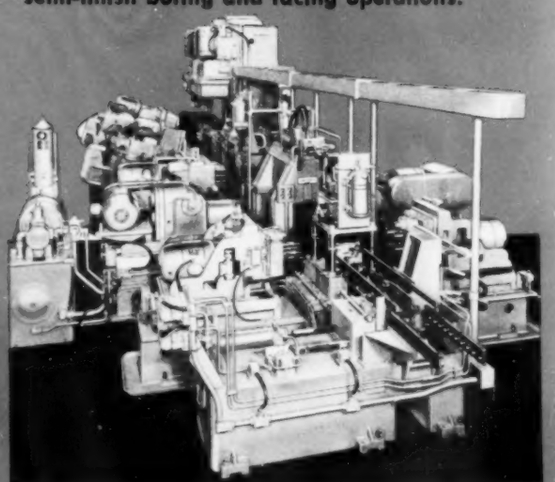
SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.

ng, 31 stations, 91 spindles. In top ular locations inside, 51 holes are mi-finish and finish reamed, spot- ted 90 degrees and rotated.







TRIPLE C CUTTING COOLANT

It Packages 3 GREAT ADVANTAGES for you—*AND MORE*

CLEAR
COOL
CLEAN

You get more cuts and cleaner cuts. Triple C is non-gumming, non-galling, anti-rust. Friction is reduced. . . . Extreme pressure lubricity gives you longer tool life.

Triple C Cutting Coolant is water-soluble, non-oily and non-greasy. It is not subject to the development of any foul odor. Work pieces are not slippery; are easy to handle.

Your men will like Triple C Cutting Coolant, because it eliminates all fire hazards; is smokeless and foamless. Its vapor is harmless to the operator. There is no danger of skin infection. Work-pieces are clearly visible.

Triple C Cutting Coolant — the long awaited answer which sidelines serious obstacles to today's steadily increasing feeds and speeds. Tested and proven amazingly effective in nation-wide operation, Triple C actually revolutionizes technology in this field. Every molecule is a complete unit that contains all the elements requisite to ideal cooling and lubrication. Triple C solutions never break or separate. Lengthen your tool life! Step up production! Maintain accuracy and safety to your operators! *Triple C Cutting Coolant does all three!*

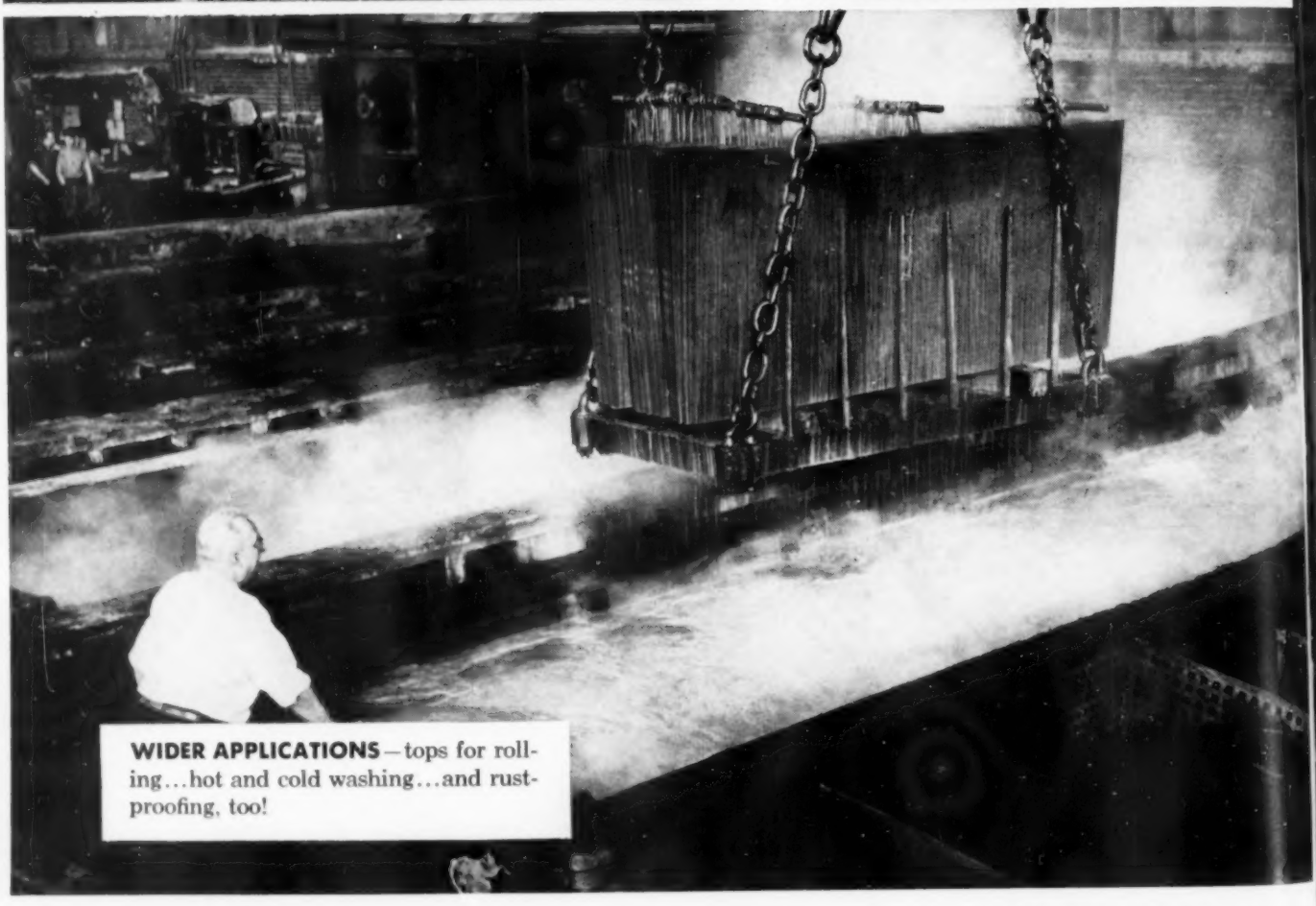
• *Your Motch & Merryweather dealer carries Triple C Cutting Coolant in stock.*

THE MOTCH & MERRYWEATHER MACHINERY CO

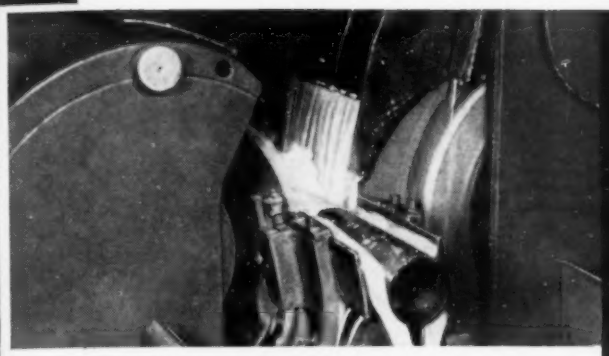
CUTTING TOOL MANUFACTURING DIVISION
CLEVELAND 17, OHIO
Stocking Dealers in All Industrial Centers

TRIPLE-CHIP CIRCULAR SEGMENTAL AND SOLID CUT-OFF BLADES • TRIPLE-CHIP SLITTING SAWS • KROSLOK FACE MILLIN
CUTTERS AND END MILLS • TRIPLE C GRINDING COOLANT • TRIPLE C MACHINE CLEANER • TRIPLE C CUTTING COOLAN

GREATER COOLING POWER—better finishes...tools last longer...production costs reduced.

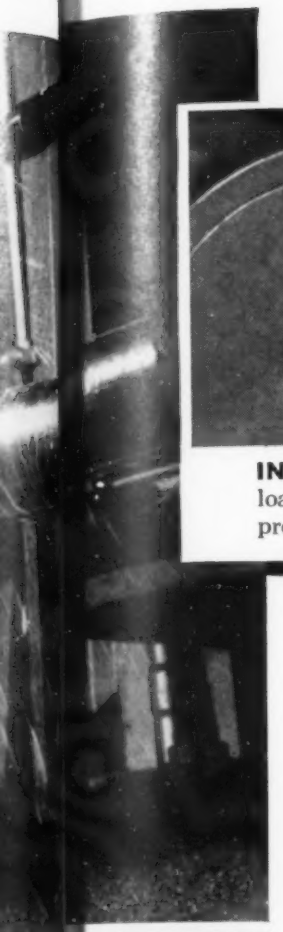


WIDER APPLICATIONS—tops for rolling...hot and cold washing...and rust-proofing, too!



INCREASED DETERGENCY—prevents loading and glazing of grinding wheels, prolongs wheel life.

NEW S.E.C.O.—pours and mixes easily... has better operator acceptance... keeps parts and machines cleaner.



Industry's most widely used soluble cutting oil continues to give highest machining efficiency

OVER 100 MILLION GALLONS OF S.E.C.O. EMULSIONS USED IN '54

The reasons? Simple.
Primarily, industry has faith in Sunoco Emulsifying Cutting Oil. Its high machining efficiency has proven itself over a period of years. S.E.C.O. is the original 100% petroleum emulsifying cutting oil. 'Way back in 1916, machinists started using S.E.C.O.

Constantly improving in quality over the years, S.E.C.O. is now better than ever. During 1954 new refining facilities once more improved industry's most widely used cutting oil... gave users even higher machining efficiency ...better finishes... longer tool life... increased production.

Test the new S.E.C.O. in your own plant. Notice how its high detergency and purity keeps tools, parts and machines clean... how easily it mixes in hot, cold or hard water. Notice, too, how S.E.C.O. cuts operating costs... improves rolling operations, hot and cold washing, and rustproofing.

See for yourself why Sun's S.E.C.O. continues to be the leading emulsifying cutting oil in the country today. For information, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-11.

SUNOCO

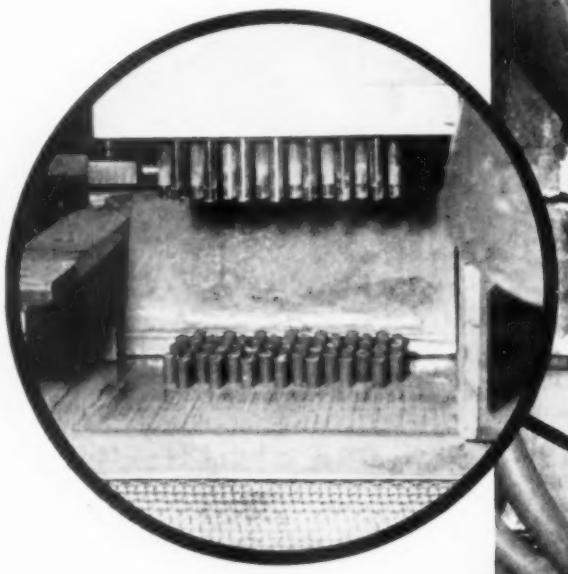
INDUSTRIAL PRODUCTS DEPARTMENT

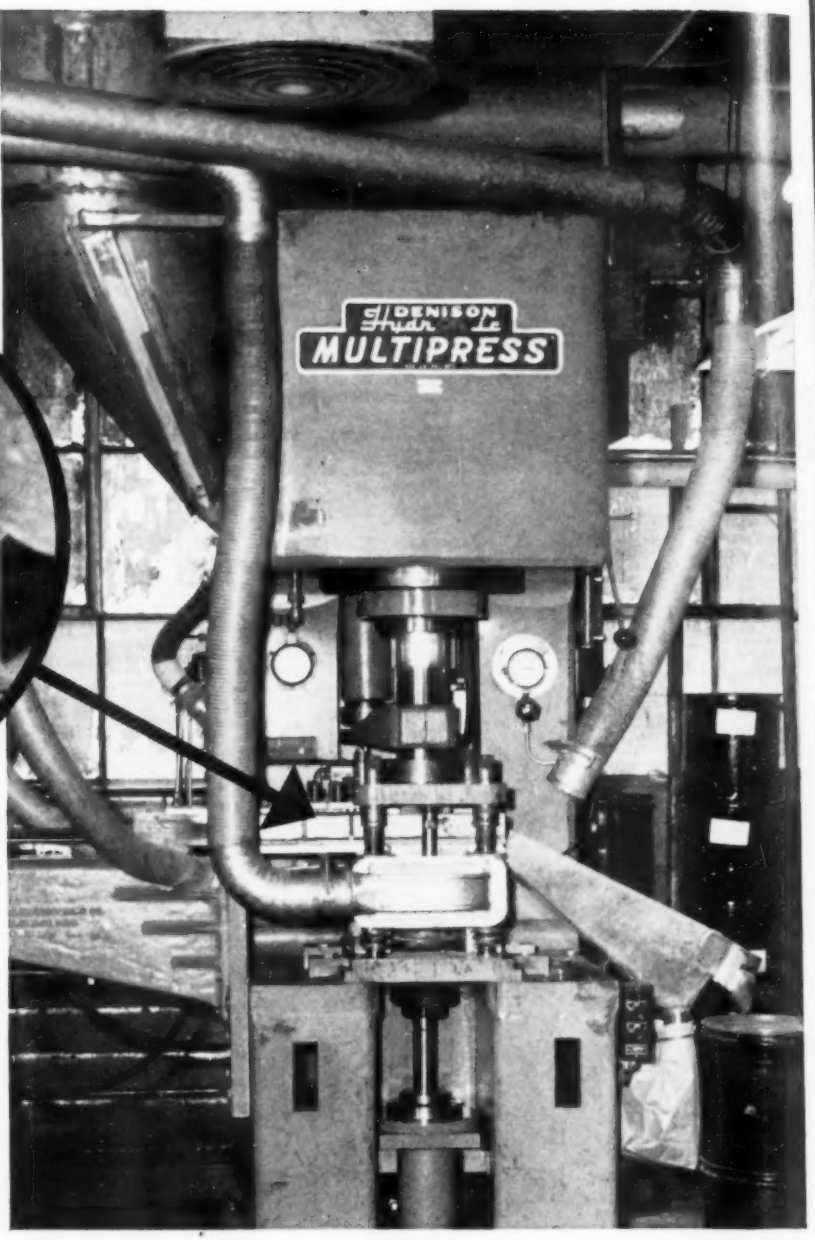
SUN OIL COMPANY

PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY LTD., TORONTO AND MONTREAL

Compacts 40,000 tablets an hour





...automatically with DENISON MULTIPRESS®

an idea that simplifies many compaction jobs ... to save you money

52 TABLETS PER CYCLE coming off multiple-cavity die after compaction on Denison hydraulic Multipress. Tablets come down chute, are collected and coated.

52 tablets compacted with every ram cycle add up to 40,000 tablets an hour. That's what's turned out on a Denison hydraulic Multipress at this leading pharmaceutical company.

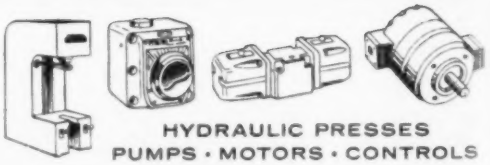
The entire operation is automatic. Results are uniform, cost is low.

Hoppers feed powder to a Denison Shuttle Feed Accessory that loads a multiple-cavity die. Two rapid, precision pressure controlled strokes of the Multipress ram compact the powder into tablets.

Many operations of compacting powdered materials can now be done faster, simpler . . . at substantial reductions in cost with Denison hydraulic Multipress and accessory equipment. Have a Denison Engineer study your operations and demonstrate how. Write.

THE DENISON ENGINEERING COMPANY
1182 Dublin Road • Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.

DENISON HydrOILics



HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

LAPOINTE

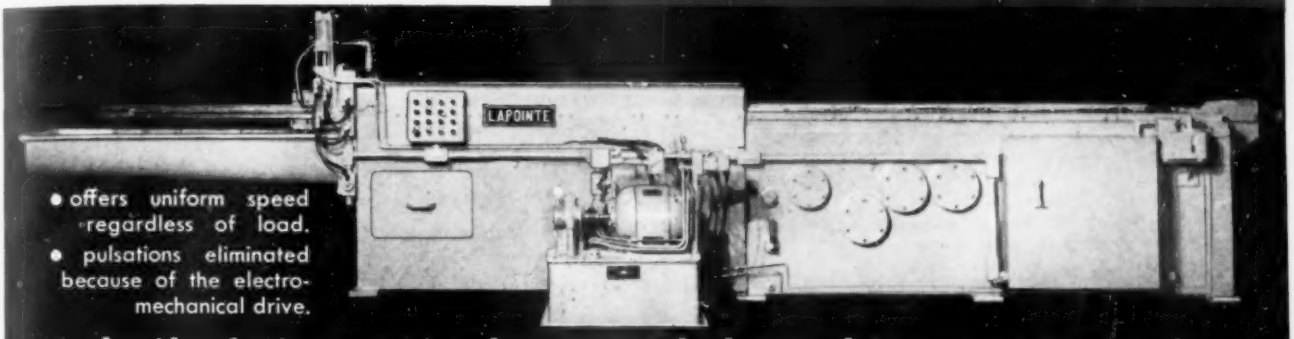
BROADCHING

leads the way,
with a machine for

SPROCKETS and GEARS

... and the same machine can
be adapted to broaching

CIRCULAR SAWS



- offers uniform speed regardless of load.
- pulsations eliminated because of the electro-mechanical drive.

built for amazingly smooth broaching operation!

this new LAPOINTE 60 inch stroke HORIZONTAL

ELECTRIC DRIVE

offers speeds up to

BROACHING MACHINE

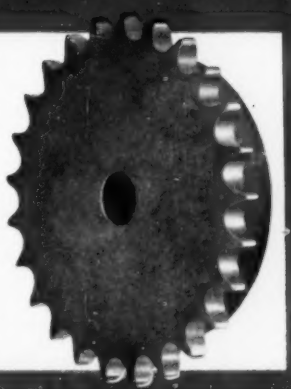
300 feet per minute!

With CARBIDE TOOLING, you can make your own estimate of the production possibilities of this exceptional machine, which operates *10 times faster* than conventional type horizontal machines!

CHANGE GEAR FIXTURES
are available for broaching **SPROCKETS**
in a series of ranges from
4" to 20" diameter
18 to 112 tooth sprockets
3/8" to 5/8" pitch
Note: Fixtures and tooling can be provided for larger sprockets and a greater number of teeth.

Send us your inquiries!

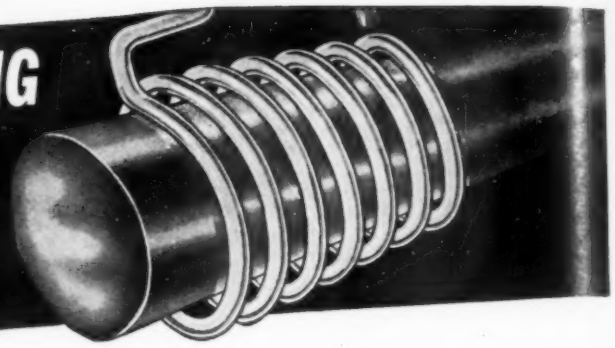
this 25 tooth sprocket
is an example of the work that this machine is particularly designed for. Broaching two at a time at 150 feet-per-minute, and holding a tolerance within .002", the net production is
one sprocket per minute



THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

YOU CAN HEAT ANYTHING
FROM A NEEDLE . . . TO A TURBINE SHAFT
FASTER and BETTER



WITH **LepeL**

HIGH FREQUENCY
Induction
HEATING UNITS

BRAZING

Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING

Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING

Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING

Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

MELTING

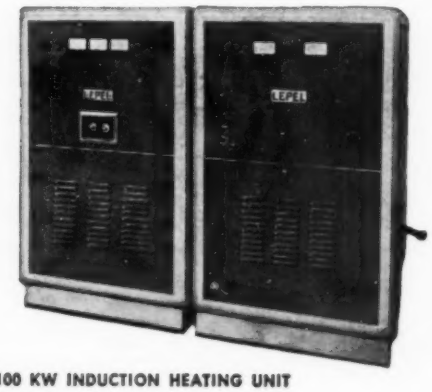
Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.

2½ KW INDUCTION HEATING UNIT

30 KW INDUCTION HEATING UNIT



100 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

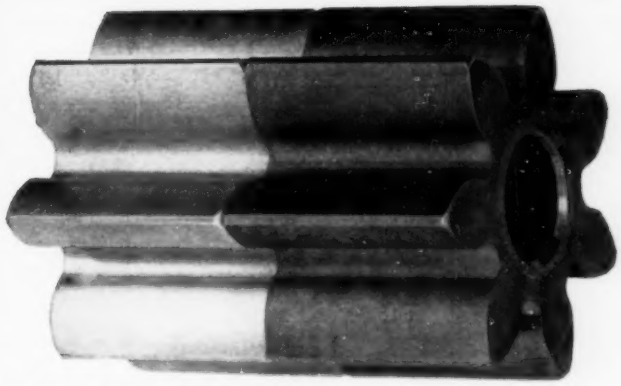
WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

This Month's

GEAR PIX

RECORD SETTERS are these Shear-Speed gear shapers shown in final stage of assembly. More and more of these machines that cut all teeth simultaneously in a gear or similar toothed part are helping to set today's production pace.



CAST BLANK ON BOTTOM, steel blank on top, eliminates burrs when all teeth on both gears are cut simultaneously on Shear-Speed gear shapers. These mating automotive oil pump gears operate more smoothly due to close tolerances, smooth surface finishes, and perfectly formed 0.080-inch radii at the tooth fillets with no scallops or ridges. Three Shear-Speed gear shapers produce these gears for one of the best known automobiles.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD.

BAY STATE MOUNTED WHEELS & POINTS

These "WHEELS of PROGRESS" are establishing outstanding records of achievement and dependability.

They are uniform in density and hardness.

All shaped points are trued to exact size and shape *after* mounting on spindle, positive test of ability to hold to spindle . . . run-outs can't occur . . . ready for action, dressing before using not required.

Deep knurling for extra safety, in high strength alloy steel spindles and special adhesive . . . the abrasive heads stay on spindles.

Longer useful life . . . can be used right down to the spindle.

A wide range of shapes and specifications available for immediate shipment from distributor and/or warehouse stocks.

Call on your local BAY STATE DISTRIBUTOR, he's a key man on all grinding problems.

This New Mounted Point Handbook is packed with information about BAY STATE Mounted Wheels and Points, including bonds, lubricant treatments, etc. Send for your copy today.

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO.,
Westboro, Mass., U.S.A.

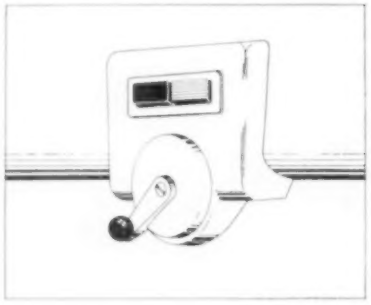
Branch Offices and Warehouses — Bristol, Conn.; Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

Manufacturers of all types of Quality Abrasive Products

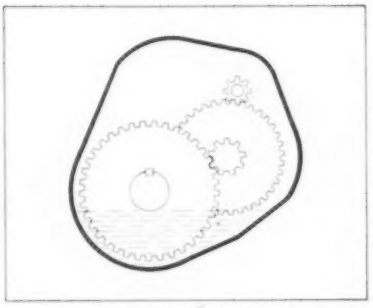
2 New CINCINNATI PRESS BRAKES

THIRTY TON - - - - - 2-30 SERIES
FIFTY TON - - - - - 3-50 SERIES

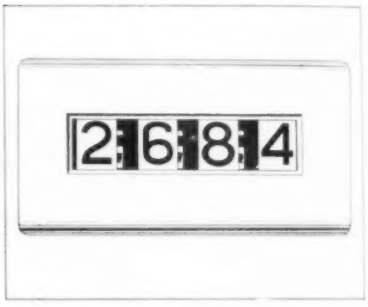
COMPETITIVELY PRICED



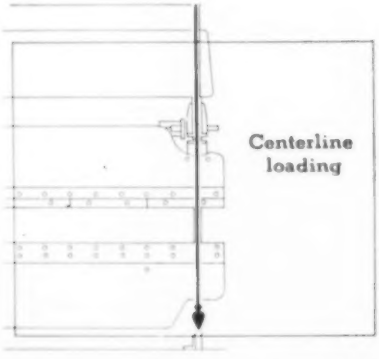
Front controlled, variable speed drive, 20 to 50 strokes per minute.



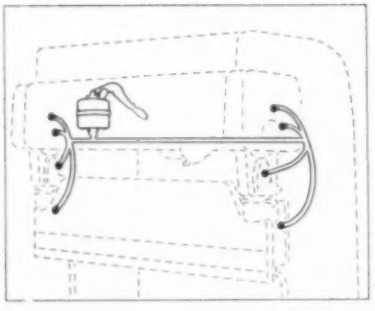
Completely enclosed transmission, running in oil.



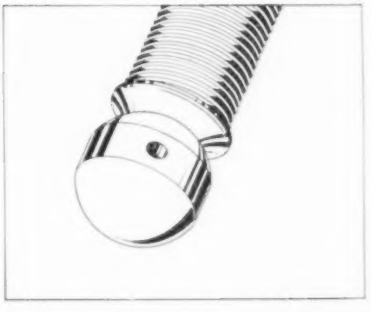
Two micrometer indicators, one at each end of the ram—easy to read and accurately record the amount of adjustment and tilt.



Centerline loading prevents weaving of the housings and insures accurate bends.



Centralized pressure lubrication system.



Ball end on the ram adjusting screws permits tapering of the ram for fade-out work.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

-30 SERIES

his new 2-30 Series Cincinnati All Steel ress Brake has a capacity of 14 gauge x 6′ ild steel.

ook at these unusual standard features:

½″ stroke—12″ shut height—9″ throat.

Distance between housings 5′-2″—overall die surface, 6′-0″.

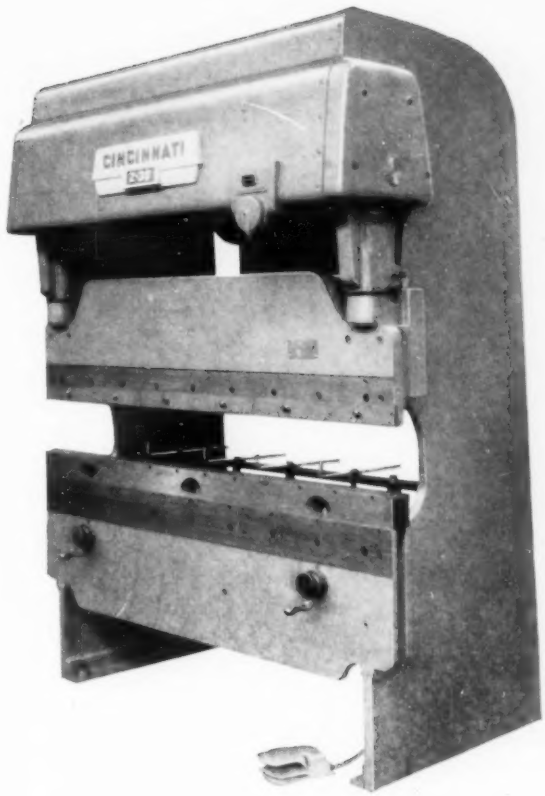
Front controlled, variable speed drive, 20 to 50 SPM. 4″ manual ram adjustment including ram tapering adjustment for fade-out work (power adjustment available as extra feature).

Bronze swivel end-guide bearing for accurate endwise alignment, even when tilting ram.

Brushless electro-magnetic brake and clutch.

Deep bed and ram, planed and drilled for 5¾″ angles.

Micrometer indicators on both ends of ram for fast, accurate setting.



3-50 SERIES

These new 3-50 Series Cincinnati All Steel Press Brakes are built in two lengths and have a capacity of 10 gauge x 6′ mild steel. Investigate these unusual standard features: 3″ stroke—12″ shut height—12″ throat—distance between housings 6′-6″ or 10′-6″—overall die surface 8′-0″ or 12′-0″—front controlled, variable speed drive, 20 to 50 SPM.

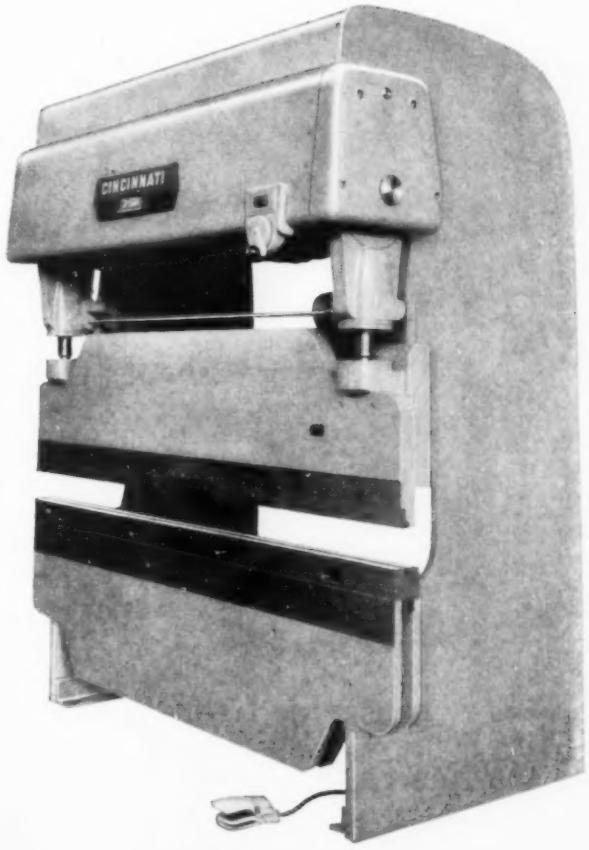
5″ motorized ram adjustment, including ram motor and control, complete with ram tapering adjustment for fade-out work.

Bronze swivel end-guide bearing for accurate endwise alignment, even when tilting ram.

Brushless electro-magnetic brake and clutch.

Deep bed and ram, planed and drilled for 5¾″ angles.

Micrometer indicators on both ends of ram for fast, accurate setting.



MORSE
ADDS NEW LINE
OF CARBIDE TOOLS
AMERICAN INDUSTRY
SEEKS CARBIDE USES
DEALERS HAIL
NEW DEVELOPMENT!
REVOLUTIONARY STEP
TO INCREASE SALES!

AGAIN...the Biggest News in the Cutting Tool Industry is brought to you by your Morse-Franchised Distributor

Read off the headlines Morse has made in the last few years! Hi-Helix End Mills . . . the Ambore Drill . . . Morse Electrolizing . . . new teletype-telegraph network to speed up service . . . then the sensational "Vectormatic" Ground Taps . . .

And now MORSE ADDS CARBIDE TOOLS . . . *to give you the most complete line of cutting tools ever offered under one name.*

This means that your Morse-Franchised Distributor is in a position to recommend the best and most economical cutting tool for every job in your plant . . . be it carbon, high speed or carbide. He's backed by Morse's years of experience in carbide tooling . . . and he's the one man who has the most in cutting tools. *Call him in today.*

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

NOW... more than ever

MORSE

means

"THE MOST"

in cutting tools

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-33

NOW!... Norton Offers Further Automation

bigger savings

in Cylindrical Grinding

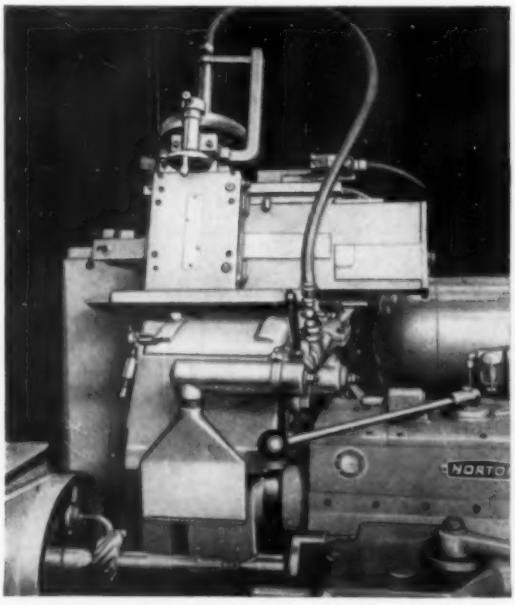
Automatic loading and wheel truing in Type CTU cut the time, work and costs of grinding small shafts.

Automation made one of its most spectacular advancements when Norton brought out the automated crankpin grinder — the sensational machine that adjusts, grinds, gauges and transfers entirely automatically.

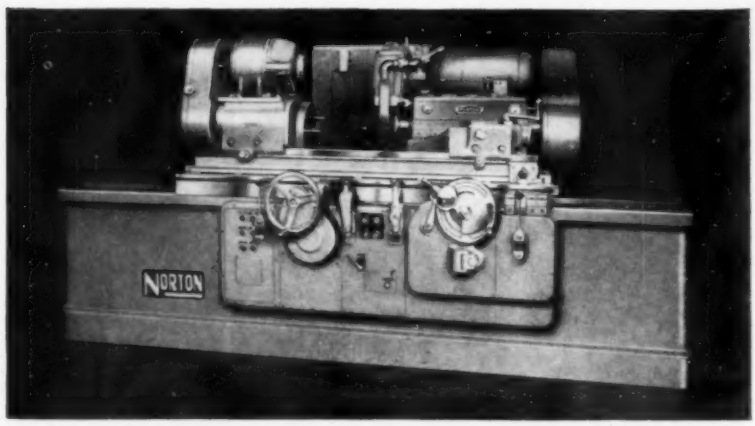
Now Norton is happy to announce further news-making progress in this field. To cut the production time and costs of grinding small shafts, new Norton Type CTU Semiautomatic Cylindrical Grinders may now be equipped with automatic loading. Combining this new feature with automatic wheel guard type truing makes this machine fully automatic in operation.

Thus the fastest, most economical and versatile grinding machine of its type is stepped up to new heights of efficiency.

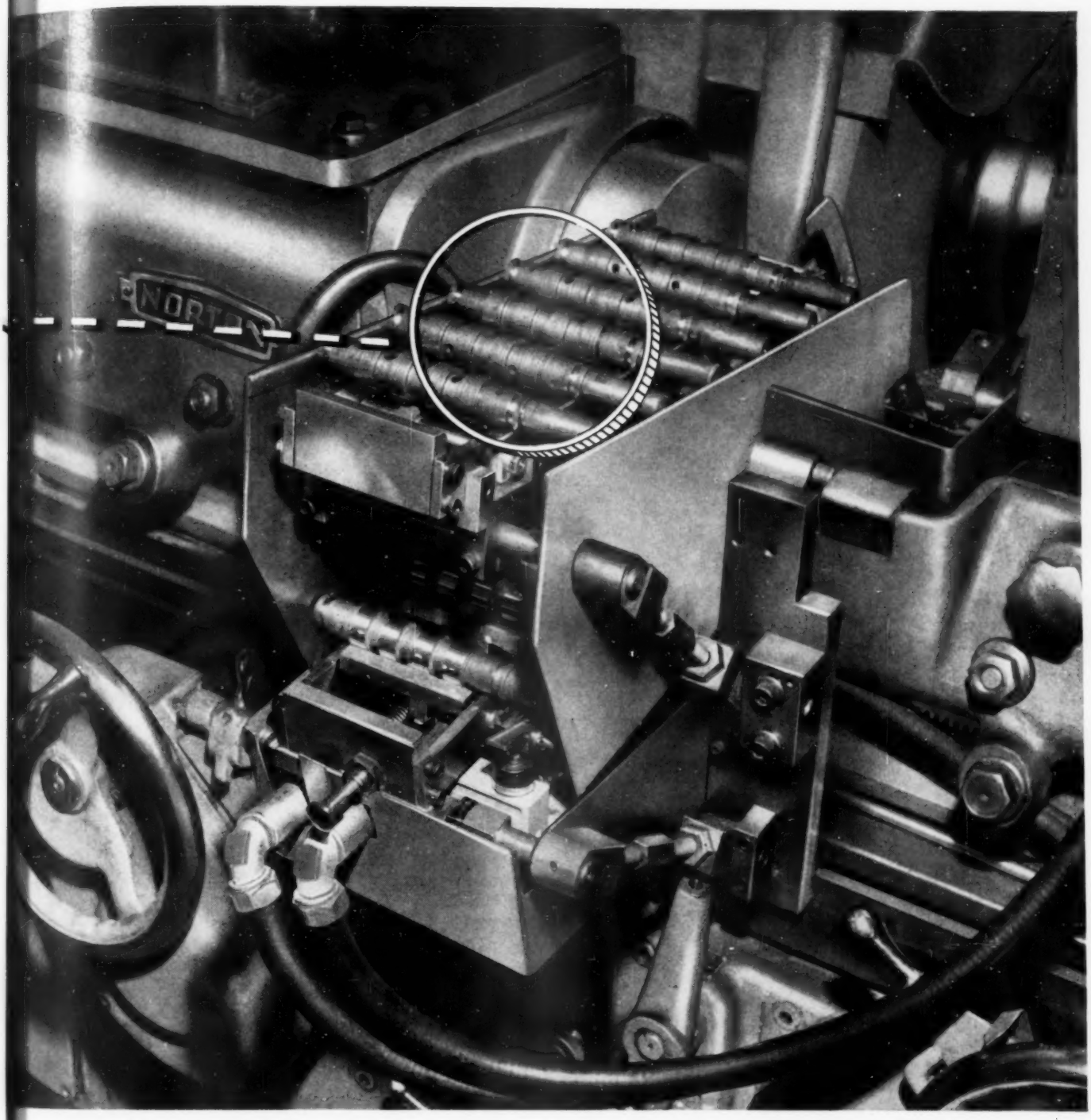
Why not see your Norton Representatives for complete facts on how these and many other advanced features of the Type CTU grinder can benefit your own production? Or write us direct. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" — to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



LESS TIME, WORK AND SKILL ARE NEEDED with the Norton wheel guard truing device, a feature of many types of Norton grinders. Shown here on the 10" Type CTU, it functions completely automatically whenever truing is necessary. In so doing it increases production, wheel life and diamond life.



This 10" Type CTU Semiautomatic Cylindrical Grinding Machine, and the 6" size, are now available for automation with Norton-engineered automatic loading and wheel truing advancements.



ANOTHER NORTON MILESTONE IN AUTOMATION. This automatic loading device, latest Norton development for 6″ and 10″ Type CTU Semiautomatic Cylindrical Grinders, speeds the production and cuts the unit costs of grinding small shafts. Its steadily paced, automatic operation enables a single operator to tend a battery of machines.

The device is adaptable to a variety of these parts, which are rolled by gravity on inclined rails. Latches between the rails separate the shafts and are arranged to release only a single workpiece at a time to the turret, which is carried on a hydraulically controlled swinging arm.

When the workpiece rolls into the turret the arm swings the turret to locate the piece in line with the work centers. As these move forward they raise the workpiece just enough to clear the turret's supporting fingers and permit free rotation.

After grinding — electrically timed — the turret is swung upward. A latch indexes the turret so that the work rolls onto the unloading rails. The turret continues its upward motion to the loading position and receives the next workpiece.

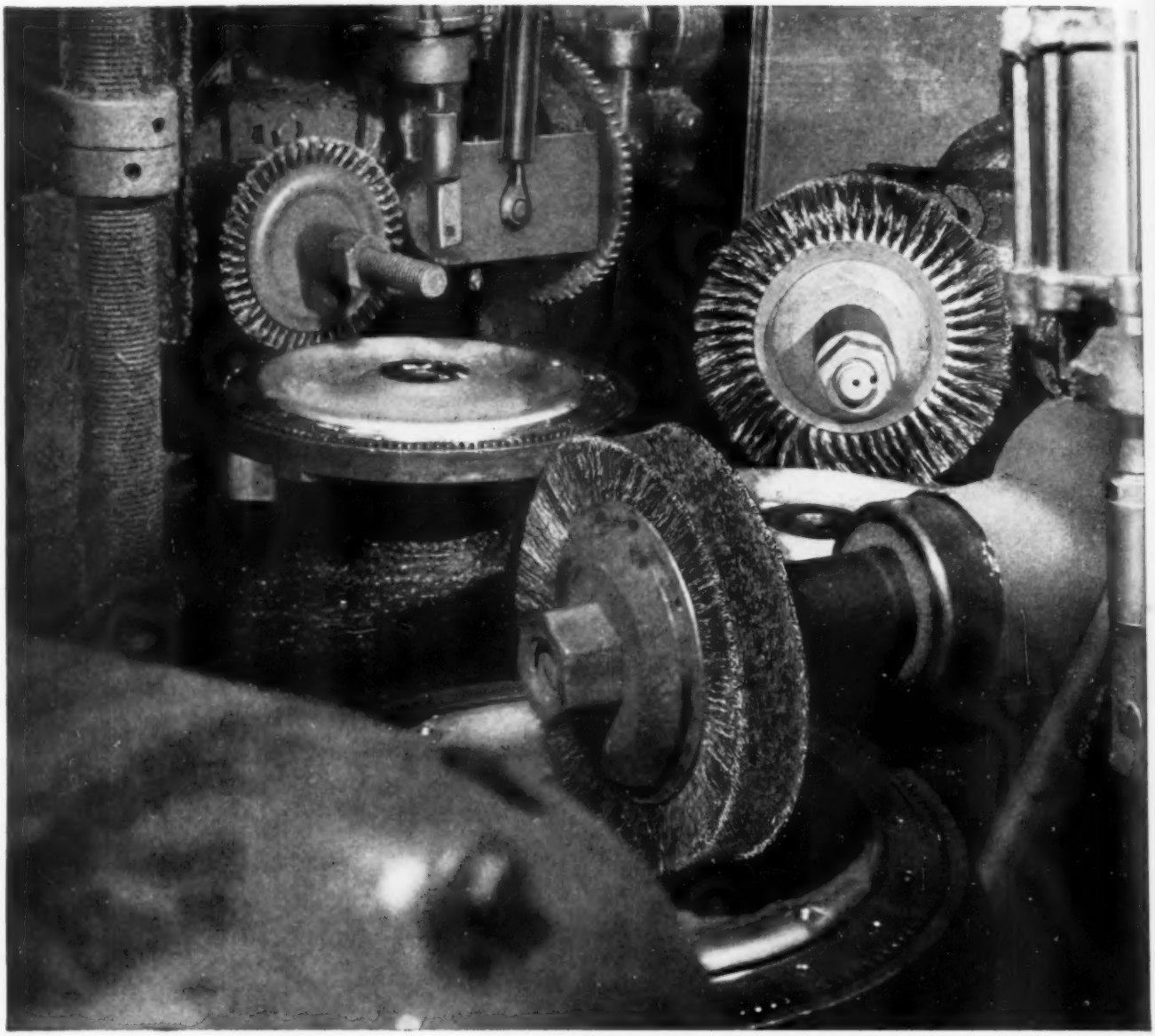
To Economize, Modernize with **NEW**

NORTON

GRINDERS and LAPPERS

Making better products...
to make your products better

District Sales Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit



GUARDING TRANSMISSIONS AGAINST BURR DAMAGE

POWER brushing quickly and effectively removes burrs which can break loose in service and cause serious trouble in automatic transmissions.

In the case of deburring holes in transmission cover plates, illustrated above, the operator simply loads and unloads parts after a one minute brushing cycle.

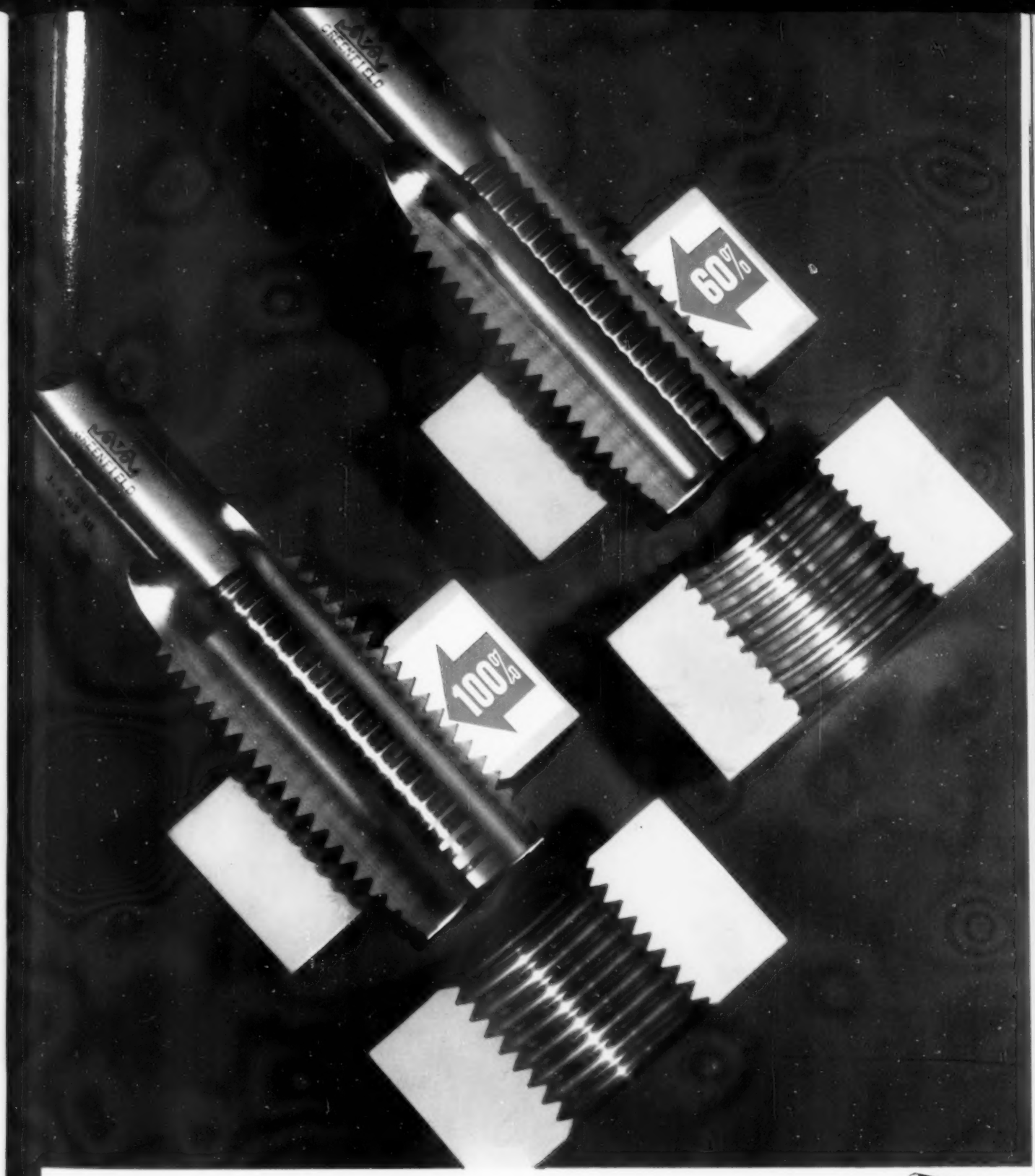
Automotive manufacturers employ a dozen or more semi and fully automatic brushing set-ups to remove sharp corners, blend surface junctures and produce micro-inch finishes here-to-fore impossible with ordinary finishing methods.

An **O**sborn **B**rushing **A**nalysis may point out ways *you* can improve parts quality yet cut costs. Write *The Osborn Manufacturing Company, Dept. K-17, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES



Where 100% is not Perfect

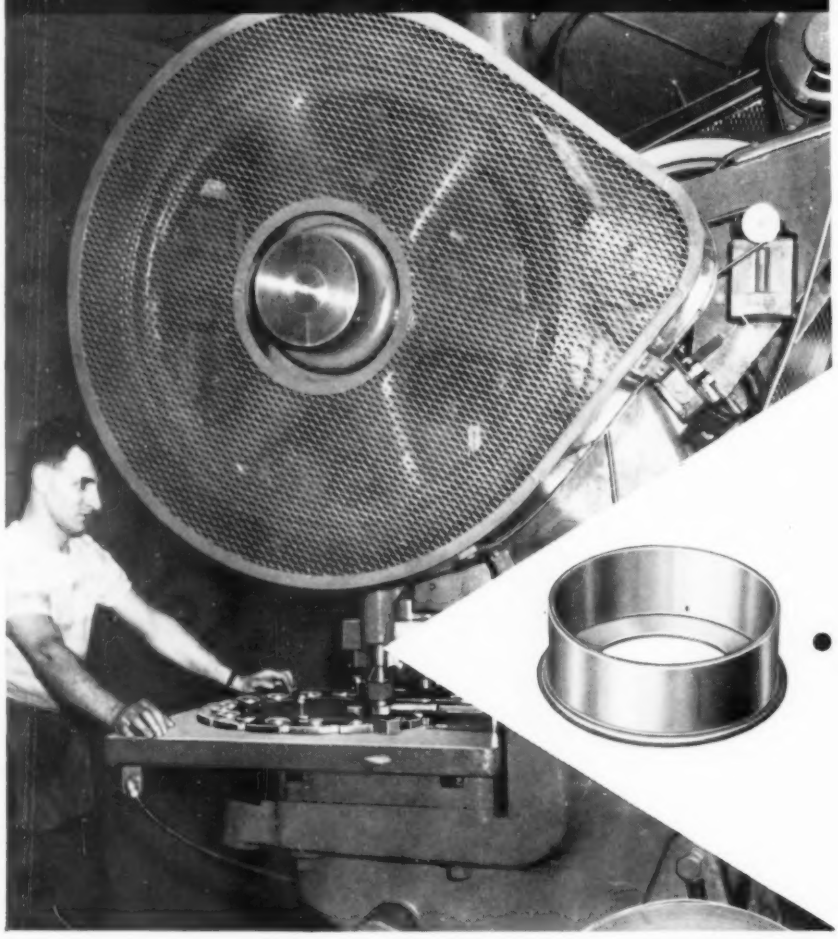
Thread strength tests clearly show that any increase in the percentage of thread height over 60% does not materially increase the strength. For the vast majority of tapped holes 55% to 75% thread is adequate. Rarely, if ever, will a 100% thread height be economical or desirable.

For a complete discussion of this point, and dozens of others which affect threading results, write for "Facts About Taps and Tapping" — the new and completely revised tapping *handbook* by GREENFIELD.

GREENFIELD TAP and DIE CORPORATION

Greenfield, Massachusetts

200%
PRODUCTION BOOST WITH EQUIPPED V&O



A 200% increase in the production of outer bearing housings has been achieved by the Omega Ball Bearing Co., Poughkeepsie, N. Y. This tripling of output was made possible by installation of a V&O 50S Press equipped with a five station progressive die and an 18 station dial feed. The old system of separate operations produced 20 housings a minute; now, 60 to 70 a minute are produced on the one press. But that's not the only advantage; Omega reports that tool breakage and rejected parts — previously expensive problems — have been completely eliminated.

Because they're built to the highest machine tool standards V & O's will get the best out of extensive mechanized tooling. The V & O long slide, and rigid frame construction give superior alignment of punch and die even under sustained high speed operation. Tools go longer between grinds, dies can be made to closer tolerances, finished product quality is higher.

THE V&O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

391 Union Turnpike • HUDSON, NEW YORK

Only the best is good enough

2nd in a Series...

OF HIGH PRODUCTION CASE HISTORIES

ASK BAIRD ABOUT IT

CHECK THIS ONE FOR

SPEED

PLUS *automation*

THE MACHINE: Baird's famous 76H Automatic Chucking Machine.

THE PART: High-compression cast iron rotor hub.

THE AUTOMATION: Automatic loading and unloading in addition to full automatic machining cycle.

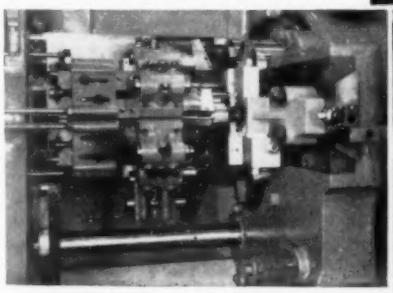
THE RESULT: 213 pieces per hour gross. The machine was set up single indexing. Its performance is typical of Baird Machines that are today the backbone of many famous high production lines. If you have a comparable job to do . . .

"Ask **BAIRD** *about it"*

Write Dept. TE.

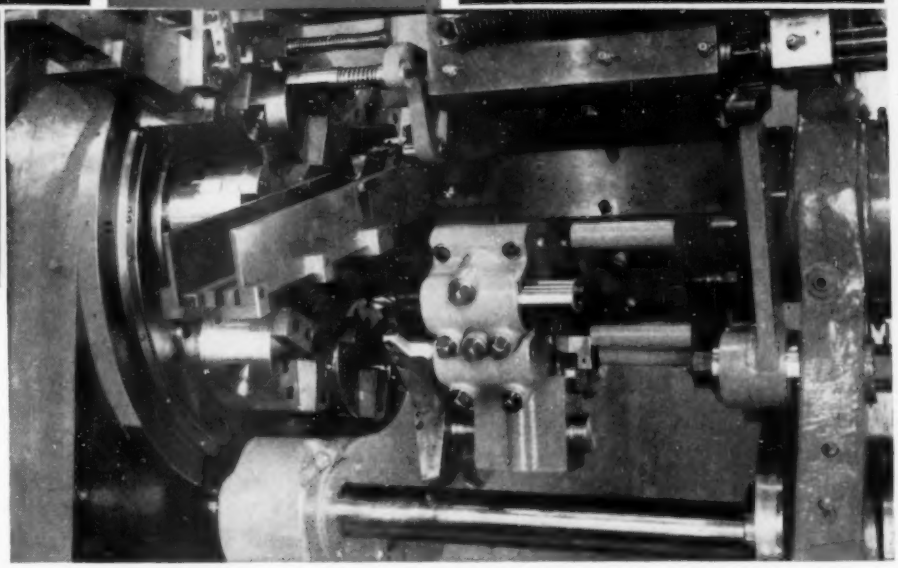
OPERATIONS:

Automatically load. Rough and finish turn O.D. Drill, true bore and ream the small hole concentric with O.D. Face and chamfer end. Chamfer holes. True bore the counterbore. Trepan bottom of counterbore and automatically unload. Illustrations also show rough castings as fed to machine.



(Above) **REAR VIEW OF TOOLING**

(Right) **FRONT VIEW OF TOOLING**
Showing load chute at upper left . . . and unload chute at center . . . both at same station.



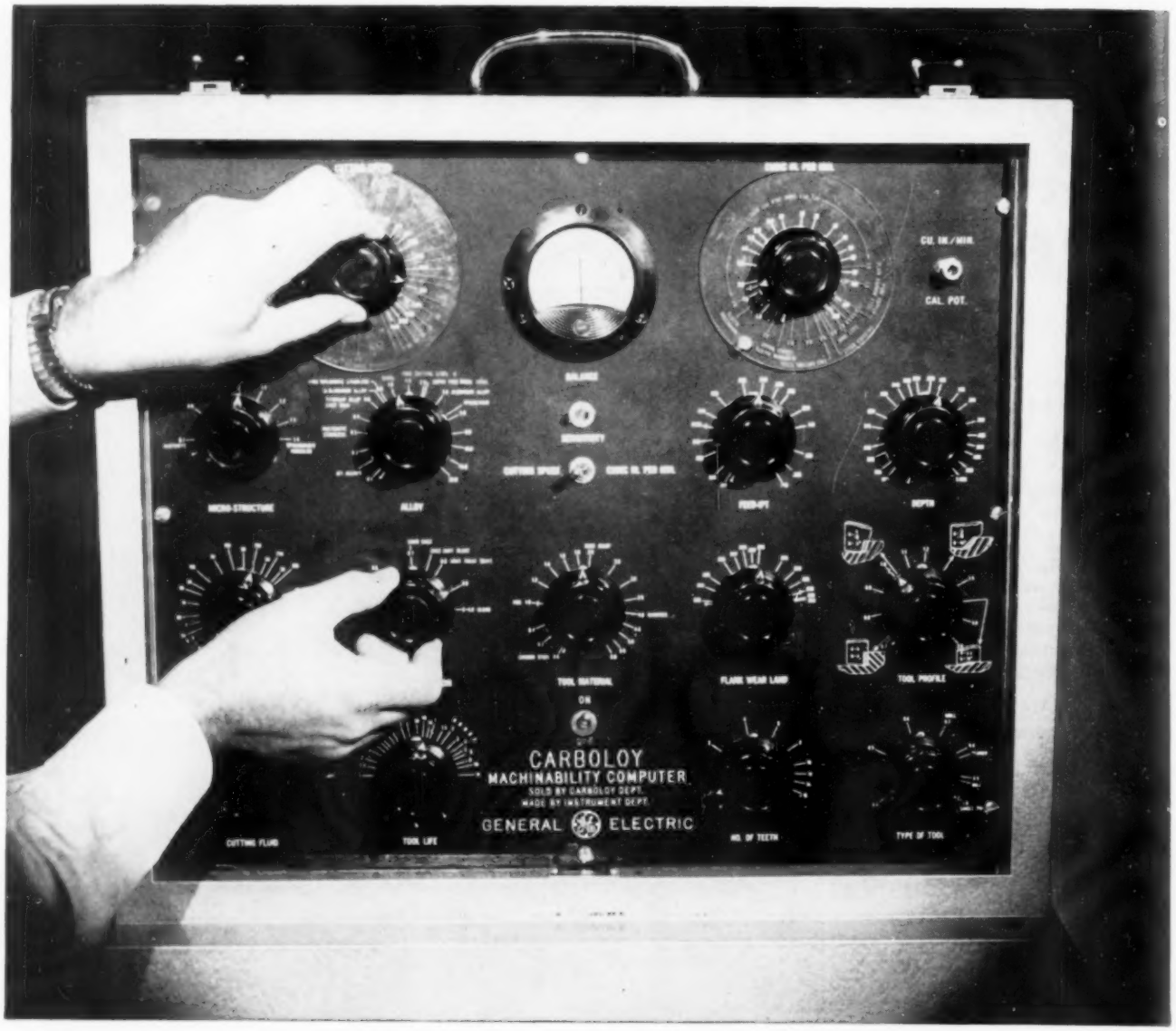
THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

68A55

Carboloy announces the
CARBOLOY MACHINABILITY



To find an unknown variable like speed, output, or motor horsepower, simply set dials according to known information. Then turn dial of unknown variable until meter (top, center) balances at zero setting. Computer instantly shows what happens when any of the variables listed below are changed.

Computes values for any of these 19 operating variables:

Material Cut:

Work material
Microstructure
Hardness
Surface condition

Cutting Tool:

Tool material
Tool life
Flank wear land
Tool profile
Type of tool
Number of teeth

Cutting Conditions:

Cutting fluids
Feed
Depth of cut
Cutting speed
Motor horsepower
Cubic inches per minute
Unit horsepower
Work diameter
R.P.M.

COMPUTER

- **New engineering tool solves complex machine setup problems in seconds, instead of hours**
- **Shows how to vary cutting conditions to increase machine, cutting tool, and operator efficiency**

In seconds, the low-cost Carboloy® Machinability Computer calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

In seconds, it shows optimum operating conditions for any metal-cutting job, eliminating wasteful experimental runs.

In seconds, it shows how to improve existing setups by the right variation of operating conditions.

Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

Results are numerical – requiring no further interpretation from the direct-reading dials. Accuracy is assured – based on more than a year's testing on in-plant applications at key General Electric plants.

Handles many jobs

The Carboloy Machinability Computer handles basic information on operating conditions, type and condition of work material, style and material of tools. The computer accurately predicts cubic inches per minute removed, tool life, and required machine horsepower. It shows how changing speed, feed, depth of cut, or tool material will affect these and other variables.

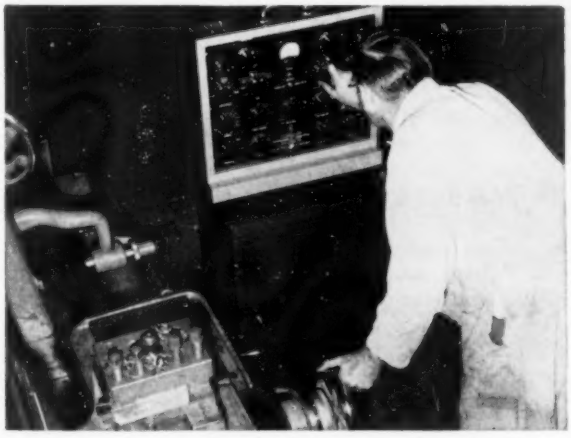
The Computer solves – in seconds – problems that would be otherwise impractical because of the large number of machining variables involved.

The Carboloy Machinability Computer was developed and proved in the field by a team of Carboloy and General Electric engineers, under the direction of Dr. W. W. Gilbert, of G.E.'s Manufacturing Services Division.

The Computer is portable (weighs only 32 lbs.), battery-operated, and measures 21" x 7" x 20".

The price of the Carboloy Machinability Computer is ... **$495.** (f.o.b. factory, Detroit)

Whether your plant is large or small, the Computer can bring you immediate benefits. Send the coupon, below, for complete information.



TYPICAL IN-PLANT COMPUTER APPLICATION

PROBLEM: Setting up 16", 10-HP lathe to turn hot-rolled 1020 steel bar with 10" diameter, to get tool life of 1 hour.

SOLUTION: Starting from scratch on a new setup, *days* could be used by experienced tool men to find a satisfactory set of operating conditions . . . with no assurance that the result would be the best possible. With the computer, the optimum setup was established, and the effect of changing key variables compared, in less than *15 minutes*.

BENEFITS: Computer turned lengthy setup time into valuable production time. On this job alone, the savings gained through days of extra production, plus savings in manpower costs, would more than equal the cost of the computer.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11101 E. 8 Mile Road, Detroit 32, Michigan

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

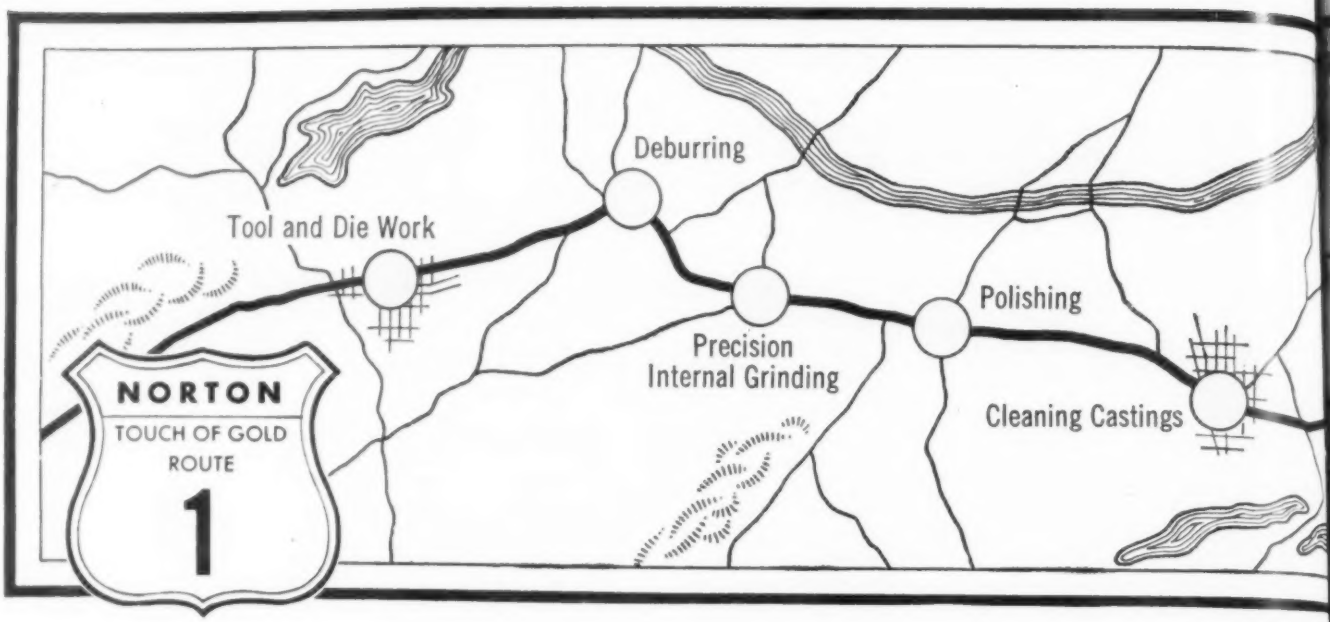
Please send me more information on the Carboloy Machinability Computer.

Name_____

Company_____ Title_____

Address_____

City_____ Zone_____ State_____



Grinding In Hard-to-Reach Places?

Take the time-and-money-saving "TOUCH of GOLD" *Route*

. . . with NORTON MOUNTED WHEELS AND POINTS

In Norton mounted wheels and points you get the same top quality materials and expert manufacturing methods used in building all Norton wheels.

You also get the benefit of *special* processes that make these small items the biggest values of their type — real "Touch of Gold" performers that grind better, last longer and save more on hundreds of jobs. For example:

Special Mounting. Norton-developed mounting techniques insure exceptional strength, keep wheels TIGHT on their spindles, even under severest conditions.

Special Truing. Norton's method of truing mounted wheels and points on their own spindles results in: (1) perfect concentricity; (2) sharpness and fast-cutting action; (3) accuracy of dimensions and shape. They are ready to go to work immediately.

Special Quality Control. That's *statistical* quality control, which provides identical duplication from lot to lot and assures you top performance each time you re-order the same specifications.

The Line Is 100% Complete

Norton mounted wheels and points come in nearly 200 standard shapes and sizes, for grinding all metals and many other materials. You can get them in ALUNDUM*, CRYSTOLON* or diamond abrasives, in all required bonds, and also in the laminated, semi-flexible BF type construction. For ultra high-speed precision grinding, special spindles and cement are available.

See Your Norton Distributor

for the mounted wheels and points that will bring the value-adding, cost-cutting "Touch of Gold" to your hard-to-get-at grinding jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

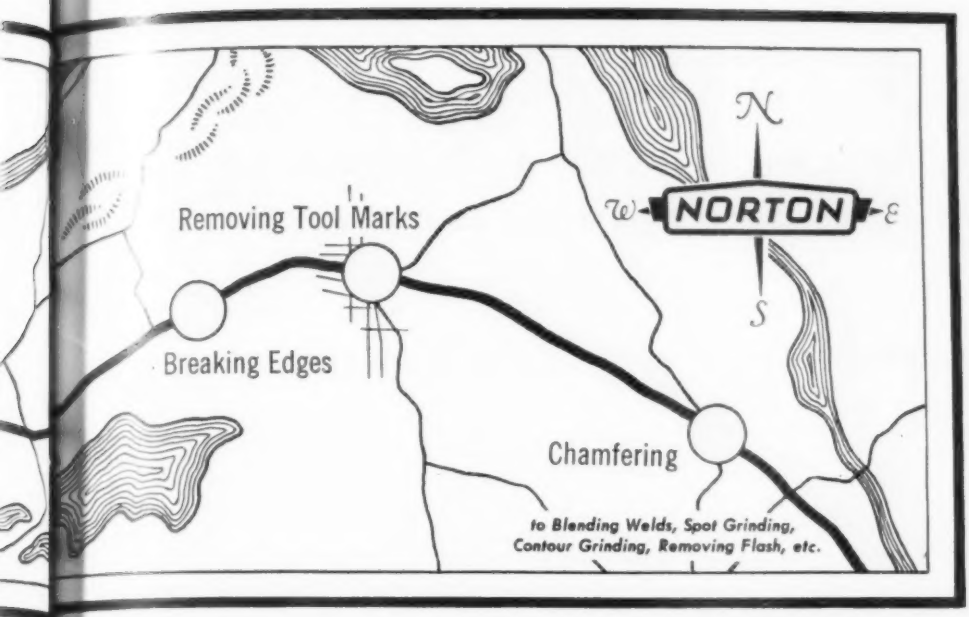
W-1652

NORTON

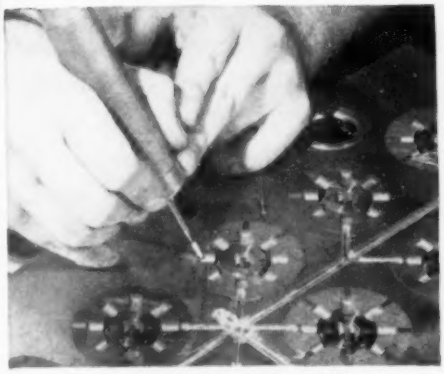
Making better products . . . to make your products better

and its BEHR-MANNING *division*

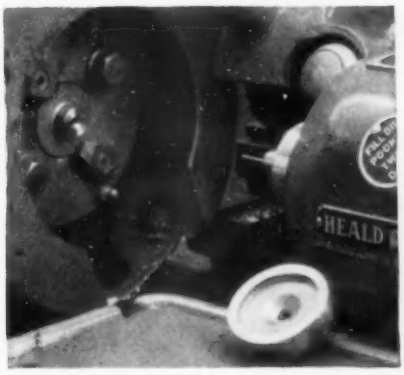
NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



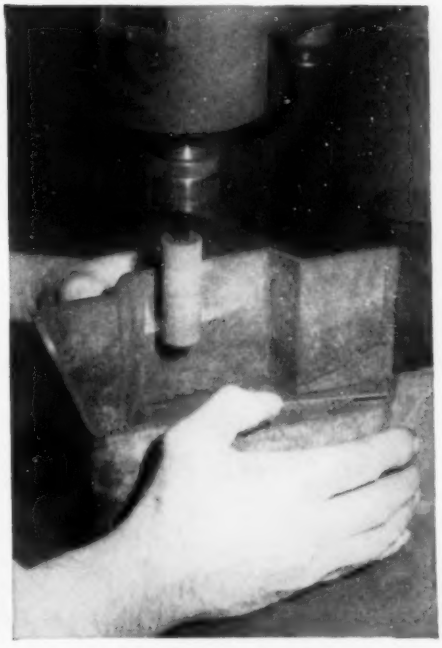
Smoothing a forging die



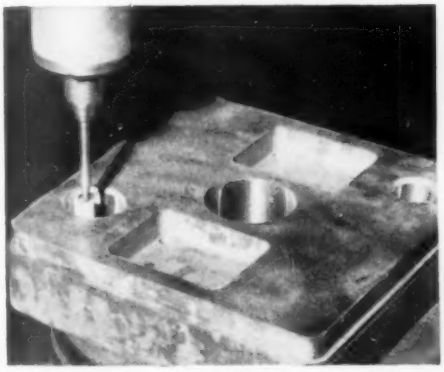
Finishing a plastic mold



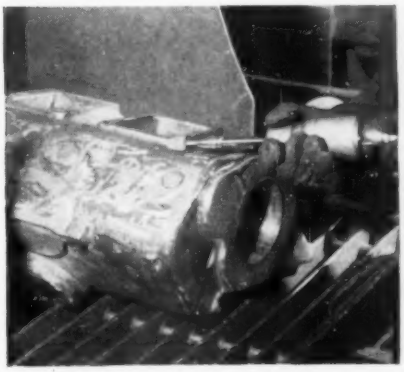
High speed internal grinding



Cleaning a cutting die

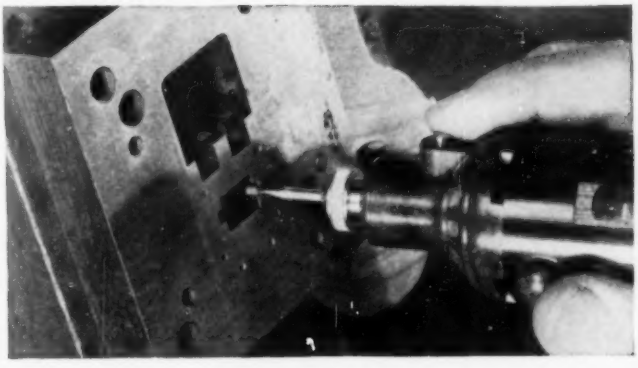


Jig grinding



Snagging a casting

Removing tool marks



Finishing a blanking die

MULTIPLE OPERATIONS

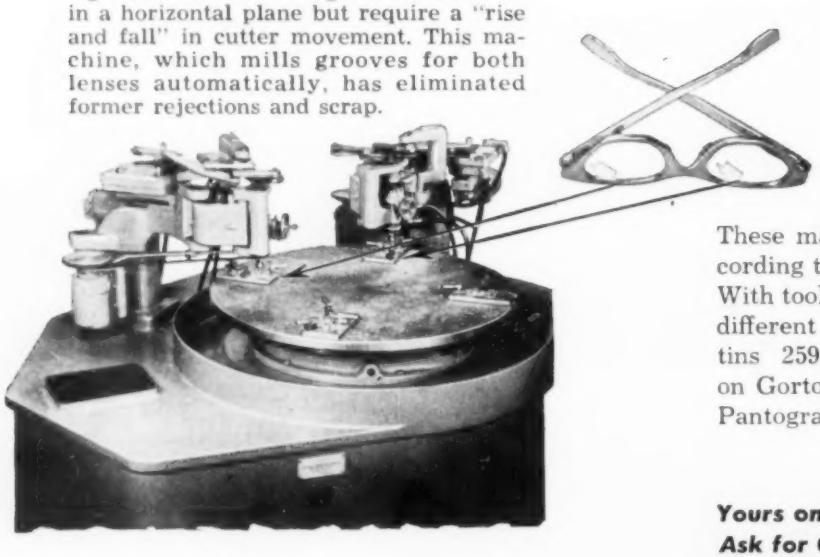
HIGH PRECISION NOW POSSIBLE IN VOLUME PRODUCTION OPERATIONS

240 PIECES PER HOUR
This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903″ wide, plus .0014″, by .109″ deep, plus .003″. Finish: 35 mcr.

Multiple operations with exceptional repetitive accuracy give you production-line performance on Gorton Multiple-Spindle Indexing Pantographs. From two to six different operations, performed at one setting, result in both precision and economy. Automatic cycling during engraving, milling, profiling, chamfering, counter-boring, grooving or routing.

Infinitely variable feeds up to the capacity of any existing cutter. Reversing drive for conventional or climb milling.

194 PIECES PER HOUR
These die-cast spectacle frames have V-shaped bezels or grooves for left- and right-hand lenses. The grooves do not lie in a horizontal plane but require a "rise and fall" in cutter movement. This machine, which mills grooves for both lenses automatically, has eliminated former rejections and scrap.



These machines are custom-built according to your specific requirements. With tooling changes, they have many different applications. Write for Bulletins 2595-DS2611 and 2604-DS2611 on Gorton Multiple-Spindle Indexing Pantographs.

Yours on request.
Ask for Catalog 1655-2611.

GORTON

GEORGE *GORTON* MACHINE CO.

2611 RACINE ST., RACINE, WISCONSIN

SINCE 1893

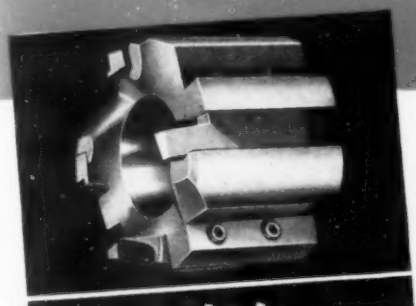
Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

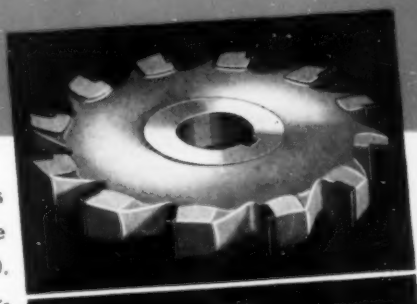
A 8383

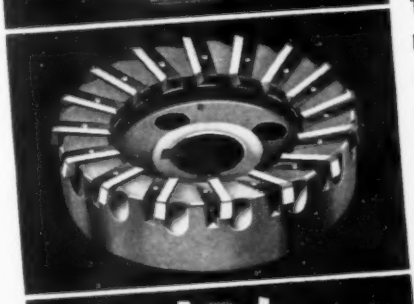
NEW! NEW! NEW!

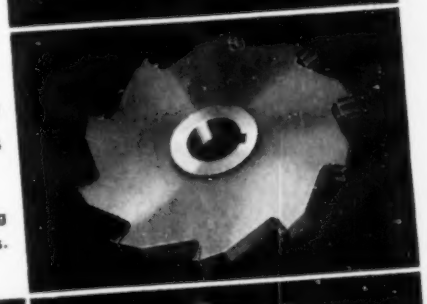
SUPER TOOL STANDARD MILLING CUTTERS NOW IN STOCK WITH CARBOLOY® GRADE 370

(For your steel-cutting applications)



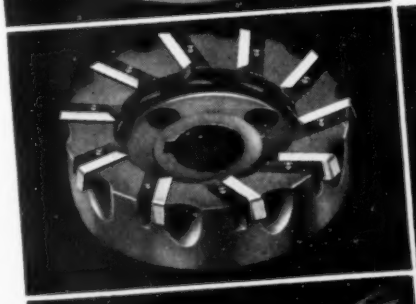


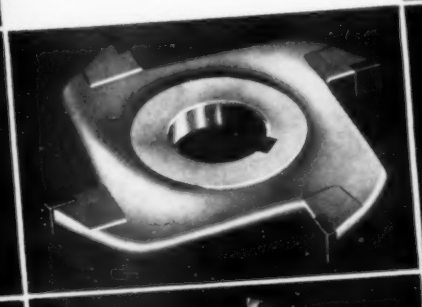


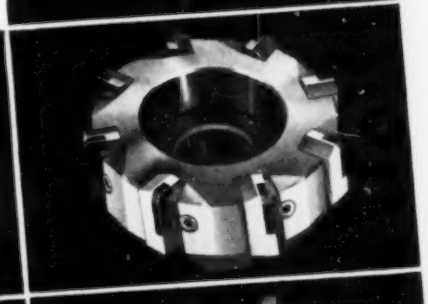


Super Tool's Standard Milling Cutters are now available for immediate delivery with Carboloy Grade 370. This new series of steel-cutting carbide cuts faster, lasts longer—operates efficiently at extremely high temperatures as proved by hundreds of actual production tests.

Write now for catalog No. 55, describing the complete line of Super Carbide Tools.







QUALITY CARBIDE TOOLS SINCE 1927

Super TOOL COMPANY

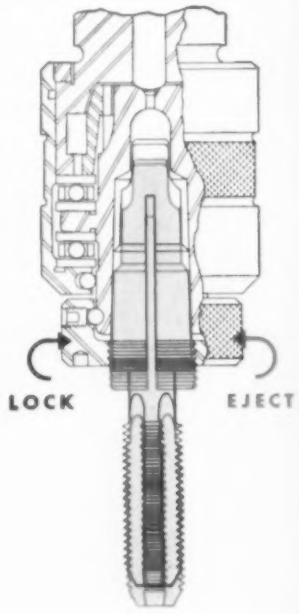
DEPT. 328 21650 HOOVER RD. • DETROIT 13, MICHIGAN

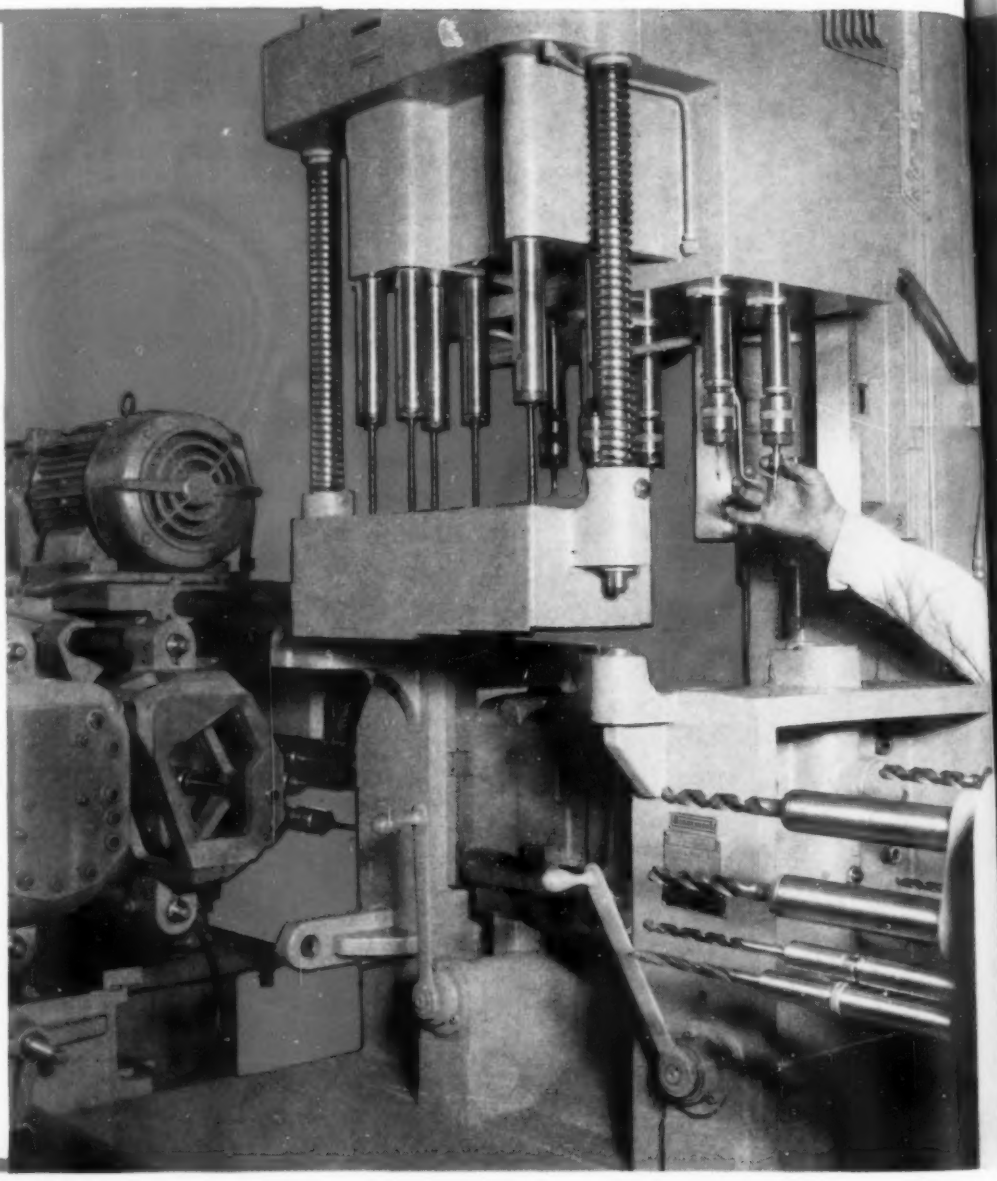
WAREHOUSES: CHICAGO • DETROIT • NEW YORK • LOS ANGELES

SCULLY JONES

"JT" Floating Holders lock provide

"Lock and Eject" design—threaded nut on nose of holder revolves freely on ball bearings, drawing threaded chuck into taper seat and compressing it evenly on shank of cutting tool. Chuck and cutting tool may be ejected separately or together by reversing rotation of threaded nut. Spanner wrench holes permit easy tool changes, even in close cluster of spindles.





BARNESDRIL uses "JT" Lock and Eject Collet-Type Floating Holders for fast tool changes

Barnes Drill Co., Rockford, Ill., produced this special 3-position drilling and tapping machine for a large tractor manufacturer. Center section frames of grey iron are machined at a rate of 22 per hour. The hydraulic lateral indexing table moves from loading position to drilling then tapping positions. Scully-Jones "JT" Lock and Eject Floating Holders were specified because of precision design, positive collet action, and free floating operation.

and eject tools faster, easier
positive collet action with free float!

One of a complete line of floating holders for precision drilling, reaming, and tapping.

Patented

More and more machine tool manufacturers are equipping their machines with Scully-Jones Precision Holding Tools to assure optimum performance. They know that use of Scully-Jones holding tools is a positive step in the reduction of over-all tooling costs through simplified operation, reduced down-time, and improved production.

The Scully-Jones "JT" Lock and Eject Collet-Type Floating Holder has proved its value in applications to standard and special machine tools. This floating holder compensates for any misalignment between tool and work on multiple-spindle operations, simplifies and speeds tool changes, and gives a true, powerful collet action on taps and reamers. The lock and eject type chuck permits easy, rapid tool changes by simply turning the threaded ball bearing nut on nose of holder. The chuck and cutting tool may be ejected separately or together, more quickly and efficiently than ever before! The threaded nut stays on the holder and eliminates need for a drift.

Small body diameter permits close center work, while the shortness of the body projection requires minimum overhang between spindle and work. A quick-lock nut on the adjustable shank provides speedy, accurate adjustment.

Scully-Jones "JT" Floating Holders are available with adjustable adapter shanks, straight shanks, and ASA or Morse taper shanks. Chucks are made for these holders for drills from 1/16 to 3/4 in., reamers from 1/8 to 31/32 in., and for taps from No. 0 to 1 in. sizes.

Call your Scully-Jones factory-trained representative or distributor for assistance in any tooling problems you encounter.

SCULLY JONES

Scully-Jones and Company, 1915 So. Rockwell St., Chicago 8, Ill.

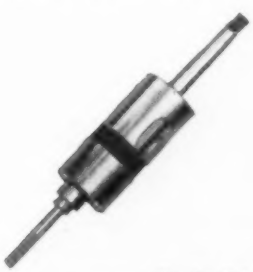
THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING AND DRIVING NEED

Recessing Tools

Adjustments for locating and controlling depth of groove automatically are precise and fast.

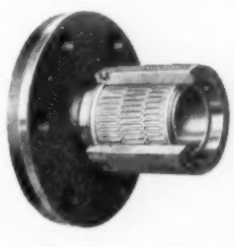
Tap Chucks

Save costly setup time. Eliminate bell-mouthed and oversize tapped holes. True collet action on shank of tap.



Floating Holders

Give unrestricted float. Reduce scrap and tool breakage caused by misalignment of tool with work.

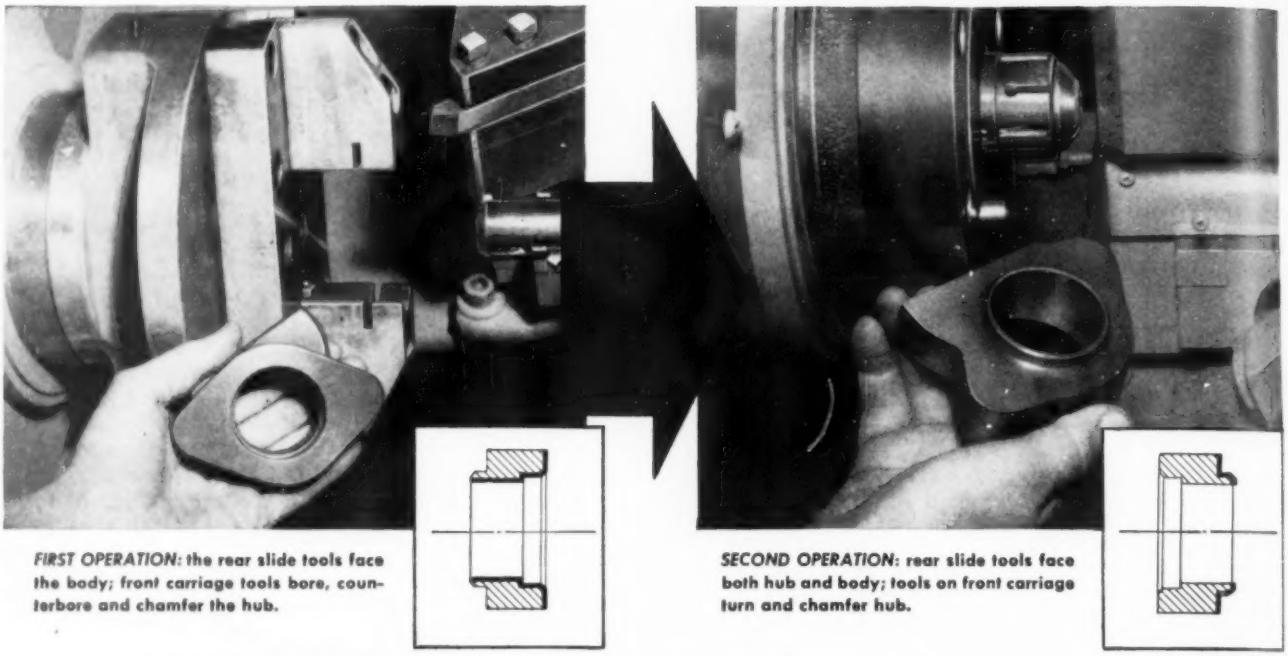


"Roll-Lock" Chucking Tools

Positive method of creating accurate, centering shrink fit to grip outside or inside diameter of work or tool.

Quick "pass-along" idea

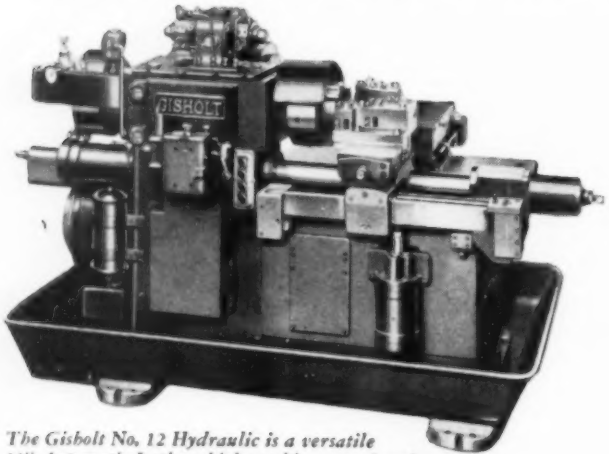
INCREASES PRODUCTION



FIRST OPERATION: the rear slide tools face the body; front carriage tools bore, counterbore and chamfer the hub.

SECOND OPERATION: rear slide tools face both hub and body; tools on front carriage turn and chamfer hub.

with pair of GISHOLT No. 12 Hydraulic Automatic Lathes



The Gisholt No. 12 Hydraulic is a versatile 12" Automatic Lathe which combines speed and accuracy with easy setup. Ideal for both chucking and between-centers work.

One operator with two standard machines now handles these cast iron manifold bodies in rapid succession—at a pace of 80-per-hour, at 80% efficiency.

This two-machine team pays off many ways: The operator loads and unloads one machine while the other is working—*automatically.* Investment is at a minimum because both machines *and* tooling are standard. Tool setups and replacements are simple.

Whether you have continuous runs like this or even smaller job lot work—the speed and automatic operation of the Gisholt No. 12 Hydraulic may be your answer to lower costs. It's worth investigating.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Production Up 50 pct with Bearcat Riveting Tool

For some time a manufacturer had been using a tool made of alloy steel, 2 1/8 in. round, to cold-rivet weight-lever sets, 1 7/16 in. sq, for railroad switch stands. The tool was used in a series of rotating blows, average production being 70 pieces per tool before redressing was required.

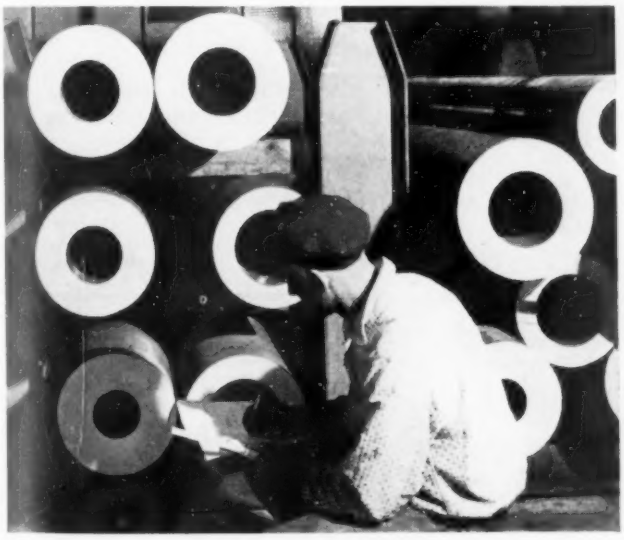
As the operation clearly called for steel with exceptional resistance to shock and wear, we suggested, "Why not give Bearcat a trial on that job? Bearcat's got the toughness you want. What's more, we wouldn't be surprised if it gave enough longer life to bring down your costs."

They made the change, with the result that tool life increased about 50 pct.

Bearcat is a tough, general-purpose grade of air-hardening tool steel. It has exceptional resistance to shock, and superior wear-resistance. Its air-hardening characteristic minimizes quenching hazards, and also provides good resistance to distortion in heat-treatment.

In addition to cold-riveting tools, there are many other applications in which Bearcat gives a good account of itself —in such tools, for example, as chisels, gripper dies, master hobs, hot headers, and die-casting die inserts.

Why not look into Bearcat? You can obtain full information from your Bethlehem tool steel distributor.



Save Time with Hollow-Bar in Ring-Type Applications

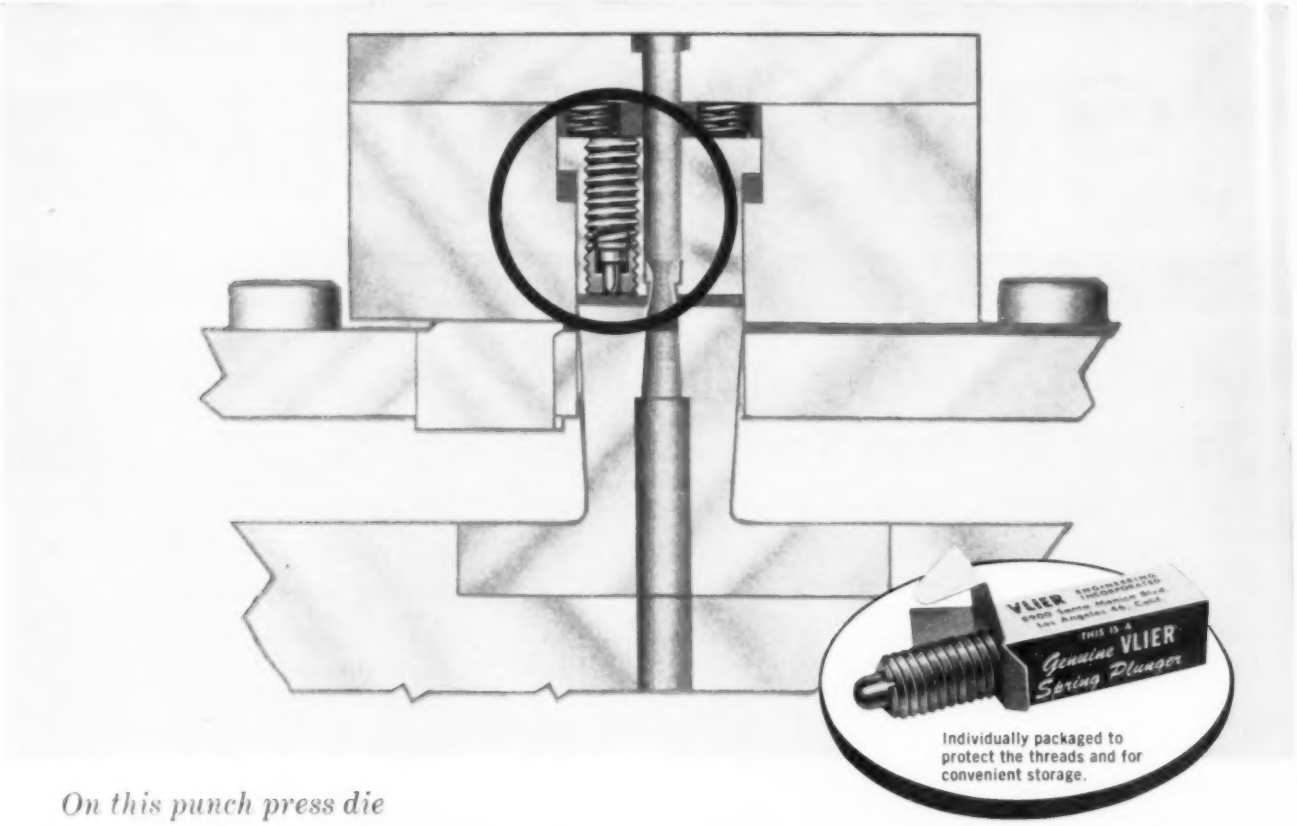
If you use draw rings, hardened bushings, ring dies or the like, you'll find you can save time in the shop with Hollow-Bar Tool Steel. Bethlehem Hollow-Bar comes in two types: BTR (oil-hardening) and Lehigh H (high-carbon, high-chrome). It's made by a high-speed trepanning process, which cores out the inside diameter of hammer-forged or hot-rolled, rough-turned bars. Hollow-Bar goes to work for you immediately. There's no waiting for forged rings or discs — nor are drilling, rough boring or facing, or rough turning required. Just think of the time that saves!

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's a Quick Look at Short-Run Dies

There are many types of dies used for blanking or forming where the production required may be only a few hundred pieces, or less. Such requirements occur frequently, as in the aircraft industry, for example. In such circumstances, the normal procedure of machining a die, then heat-treating and grinding it (to produce a die good for millions of parts) is neither practical nor economical. What is desired is a steel which can be machined to size, then used immediately.

One of our standard grades which is ideal for this application is Brake Die Tool Steel. Brake Die comes in rounds, squares and flats. It is a free-machining steel, and has been heat-treated at the mill to the highest hardness possible consistent with good machinability. On forming operations, dies made of Brake Die will last for tens of thousands of parts. And on blanking operations, it will produce anywhere from a few hundred parts to a few thousand, depending of course upon the type of material being blanked, and its thickness.



On this punch press die

use of a Vlier Spring Plunger saves $67.00

A typical example of how Vlier ready-made tooling accessories can save your shop hundreds of dollars every year

Formerly a "homemade" plunger device was used to break oil seals and eject parts from the punch press die shown above. Cost of resurfacing the die was unreasonably high because of time required to remove and re-install the complicated plunger device. Replacing the "homemade" assembly with a Vlier *Silvernose* Spring Plunger eliminated this lost time and, according to company tool engineers, saves $67.00 each time the die is resharpened.

As simple and quick to use as a screw

Installation and removal of Vlier Spring Plungers requires only a simple spanner-type wrench for standard nose models and an ordinary end wrench for the Hexnose type. Since only a tapped hole is required in the die, the plunger can be installed almost anywhere on the die surface. Bodies are threaded with N.C. threads, #1 fit, and rust-proofed to prevent freezing in the fixture.

Precision made

Close tolerances and large bearing surfaces between the plunger nose and the body prevent the nose from binding or wobbling, assuring perfect alignment at any extension. The nose telescopes completely within the body.

Special springs for punch press work

Springs used in *Silvernose* models were especially developed for fast, repetitive operations required in punch press work. End pressures are factory-set with the nose telescoped 50%, and are guaranteed to remain constant.

Case-hardened nose assures long life

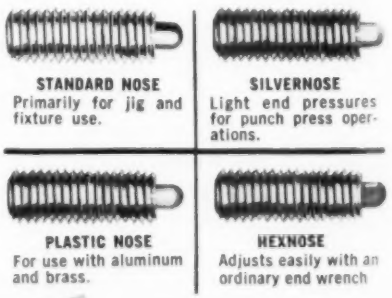
Case-hardening of the plunger nose provides maximum resistance to wear. The ductile core minimizes the hazard of fracturing under impact, common with hardened, high carbon steel.

A variety of uses

Vlier Spring Plungers are also used to position parts in jigs and fixtures, as locating pins, as detents, etc. Your Vlier distributor stocks the complete line. Call him now and order a complete assortment. They save tool maker's time and speed fabrication of jigs, fixtures and dies.

Four Nose Types Available

Wide variety of diameters and lengths.



STANDARD NOSE Primarily for jig and fixture use.

SILVERNOSE Light end pressures for punch press operations.

PLASTIC NOSE For use with aluminum and brass.

HEXNOSE Adjusts easily with an ordinary end wrench

Write for your free copy of the new 1955 Vlier Catalog

Other Vlier tooling accessories

TORQUE THUMB SCREWS · SWIVEL-PAD CLAMPS · TOGGLE PADS · SPRING STOPS · FIXTURE KEYS

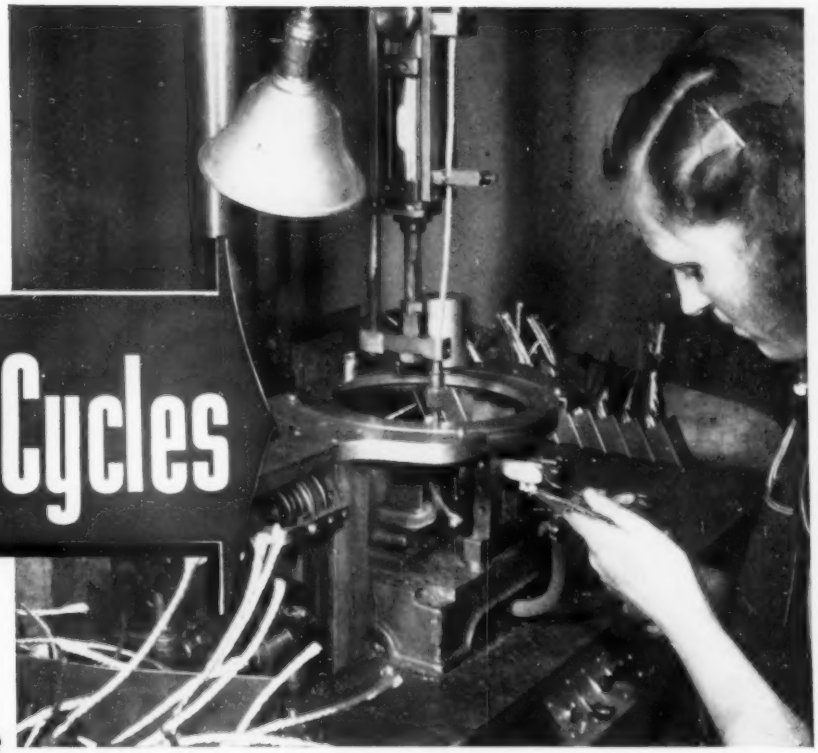
STOCKED IN PRINCIPAL INDUSTRIAL AREAS IN U.S. AND CANADA

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

How's this for Air Cylinder Economy?

31,000,000 Cycles



...in an atmosphere laden with carbon dust

Carbon dust is highly corrosive. Few air cylinders can withstand its ruinous effects. But the Bellows Air Motor — the air cylinder with the built-in valve — has completed more than 31,000,000 cycles in the plant of Electronite Carbon Co., Philadelphia — and is still going strong.

But the exceptional durability of the Bellows Air Motor on this installation is only a small part of the story.

This special machine, designed and built by Bob Silver, Electronite's Chief Engineer, uses a Bellows Air Motor to tamp wire shunts into carbon brushes. And in brushes, shunt contact must be perfectly matched to assure uniform distribution of current load. The Bellows Air Motor provides the day-after-day repetitive accuracy required for constant uniformity. Rejects dropped from 10% to one-half of 1%.

And, in addition, as Bob Silver put it, "We get at least two to four times the speed of production using the automatic method."

The Bellows Air Motor and its related "packaged" power units: rotary and linear work feeders, work holding devices, drill units, etc., make tool-room design and construction of special production machines practical and inexpensive for both long and short run operations — multiply fractional savings into an impressive cost reduction figure.

OPERATION PUSHBUTTON

The story of Electronite Carbon Co. is but one of many dramatic uses of "Controlled-Air-Power" featured in the new motion picture, "Operation Pushbutton." This half-hour 16 mm sound picture shows how industries all over the United States and Canada are applying engineer ingenuity to production processes. We'll be happy to arrange a showing for you. Write The Bellows Co., Dept. TE1155, Akron 9, Ohio, or phone your local Bellows Field Engineer.

1187-A

The Bellows Co.

AKRON 9, OHIO

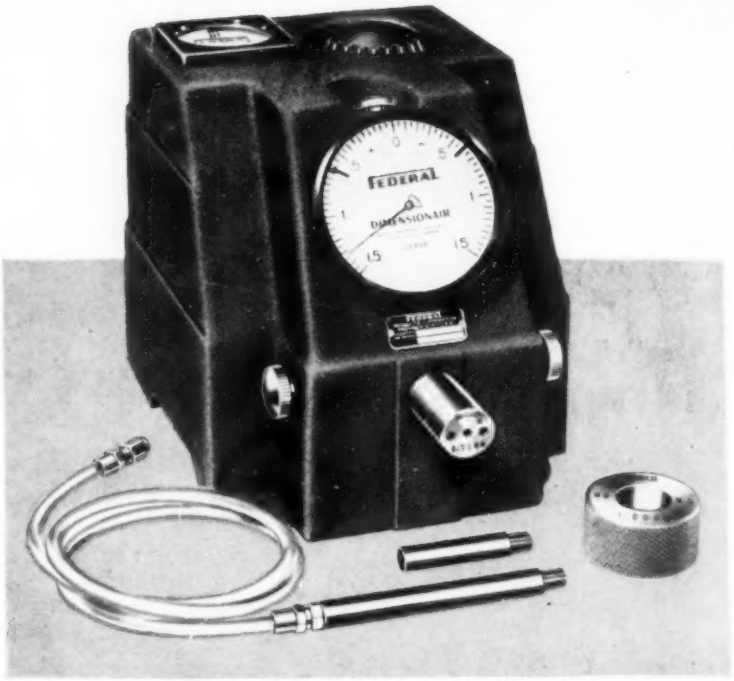
Bellows Pneumatic Devices of Canada, Ltd., Toronto

Time and Time Again . . . the

FEDERAL DIMENSIONAIR

A few of many

Accessories . . .

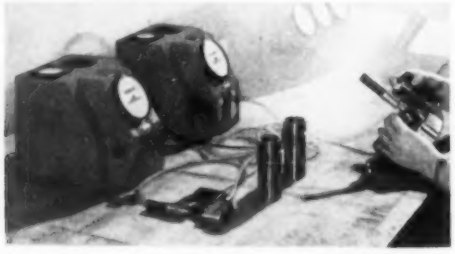


Magnifications of 2500 to 1 with .003" usable range and 5000 to 1 with .015" usable range.

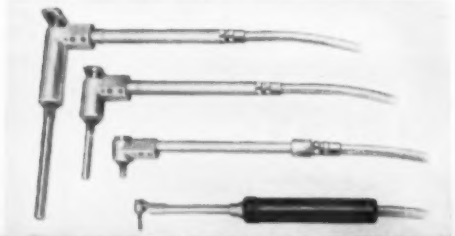
AIR PLUGS AND RINGS

AIR GRINDING GAGES

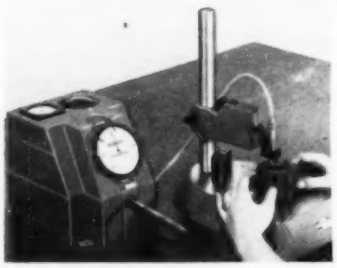
AIR SNAPS



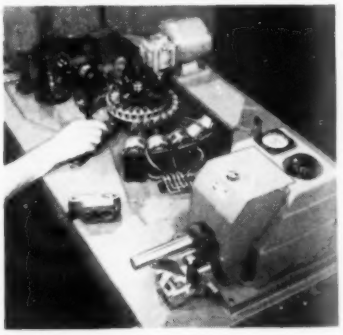
ADJUSTABLE HOLE AIR GAGES



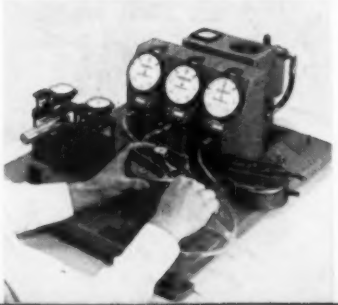
AIRPROBES



AUTOMATION AIR GAGES



SPECIAL AIR GAGES



SPECIAL AIR UNITS

Proves its Superiority!

REPEATEDLY, in direct tests with OTHER Air Gages, the DIMENSIONAIR proves itself —

MORE ACCURATE
MORE STABLE
MORE POSITIVE
LONGER WEARING

- The DIMENSIONAIR HAS LONGEST TOLERANCE RANGE, GREATER APPROACH RANGE, AVOIDS SCRAP
- IT'S THE ONLY GAGE WITH A LONG, COMPLETELY USABLE 7½" CALIBRATED SCALE
- IT'S THE ONLY AIR GAGE THAT'S NOT A GO AND NO GO GAGE: YOU DON'T JUST COMPARE, YOU READ ACCURATE MEASUREMENTS
- IT'S MUCH FASTER TO INSTALL, SET UP, AND USE THAN OTHER AIR GAGES

Let us put a DIMENSIONAIR in your plant so you can find out for yourself how valuable these advantages can be.

FEDERAL PRODUCTS CORPORATION • 51911 **EDDY STREET, PROVIDENCE 1, R. I.**

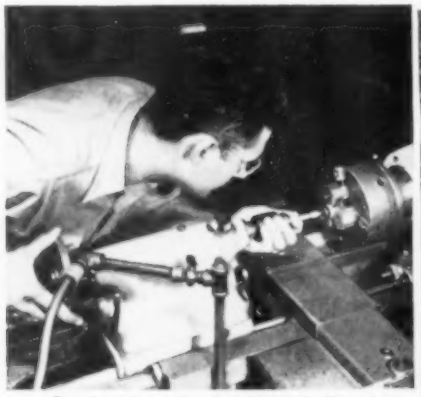
Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

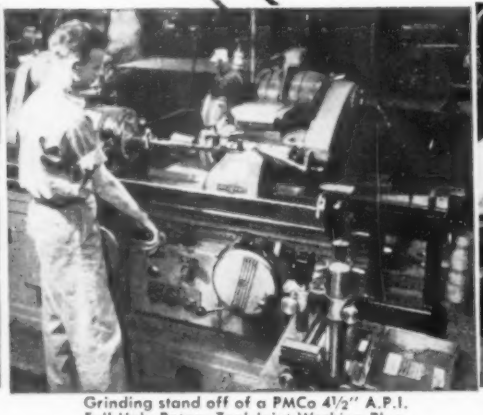
Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-53

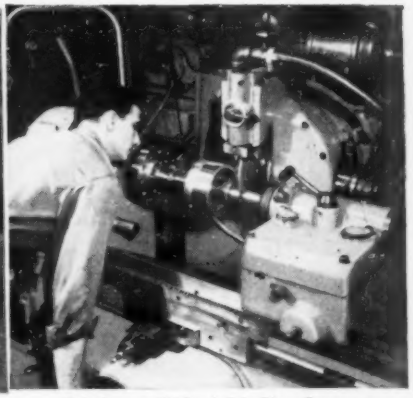
what PIPE MACHINERY CO. integrity means to you



Tapping the i.d. of #00-96NS Thread Ring Gage with .035" tap we machined.



Grinding stand off of a PMCo 4½" A.P.I. Full Hole Rotary Tool Joint Working Plug.



Grinding a PMCo A.P.I. Plug Gage on one of our automatic thread grinders.

Good steel, fine machines, the very best inspection instruments, (all of which we use) are valueless in themselves.

Pipe Machinery has put full value in them for you by adding a priceless ingredient — integrity.

Integrity instilled in the minds and hearts of our group of highly skilled, high principled craftsmen fired with but one purpose: — to produce the best possible gages for you.

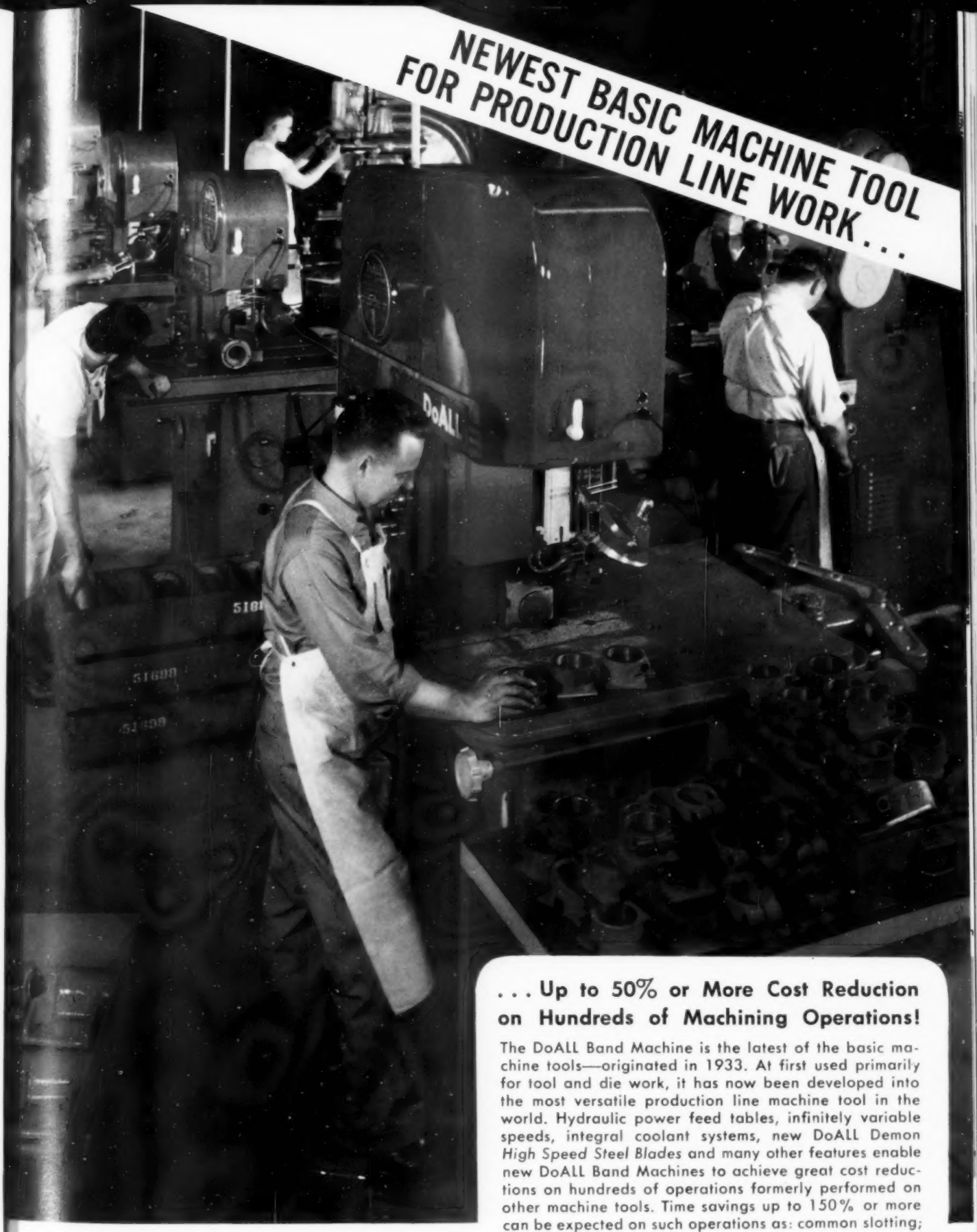
The gages they furnish you will save dollars by protecting your product.

Send for our #10 Catalog — or better yet — when you are in Cleveland, stop in and get acquainted.

THE PIPE MACHINERY COMPANY
29101 LAKELAND BLVD. • WICKLIFFE, OHIO
Greater Cleveland

PMCO

NEWEST BASIC MACHINE TOOL FOR PRODUCTION LINE WORK...



. . . Up to 50% or More Cost Reduction on Hundreds of Machining Operations!

The DoALL Band Machine is the latest of the basic machine tools—originated in 1933. At first used primarily for tool and die work, it has now been developed into the most versatile production line machine tool in the world. Hydraulic power feed tables, infinitely variable speeds, integral coolant systems, new DoALL Demon *High Speed Steel Blades* and many other features enable new DoALL Band Machines to achieve great cost reductions on hundreds of operations formerly performed on other machine tools. Time savings up to 150% or more can be expected on such operations as: common slotting; splitting; notching; trimming; contour cutting; cutting grinding reliefs, and many others.

The following pages explain the remarkable versatility and economy of this new machining concept.

DoALL

The DoALL Company
Des Plaines, Illinois

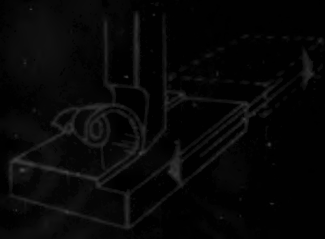
Please turn the page for details. ——→

How the Versatility of th e

WITH OTHER MACHINE TOOLS . . .

In milling or surface grinding, cuts are made in one direction

OR . . .



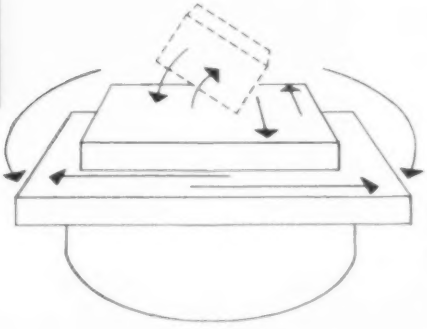
In planing or shaping, cuts are made in one direction

OR . . .

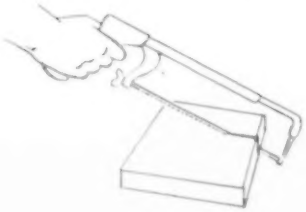
On the lathe, cuts are made on surfaces of rotating workpiece

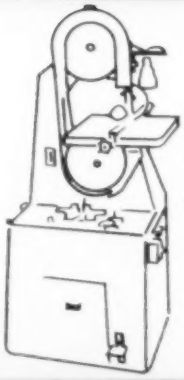
Look · · · What Band Machining Can Do!

Complete Remote Control on World's Largest Band Machine. The tremendous capabilities of the band machine are clearly shown in the picture at the left. It's the world's largest band machine — used by Alcoa at Lafayette, Indiana, to make accurate internal cuts in extrusion dies up to 36″ diameter by 30″ depth! Three synchronized remotely controlled power tables guide the work in any desired direction into the continuous-cutting band tool. The operator follows the layout line by periscope from his control station.



FIRST . . . The hacksaw.





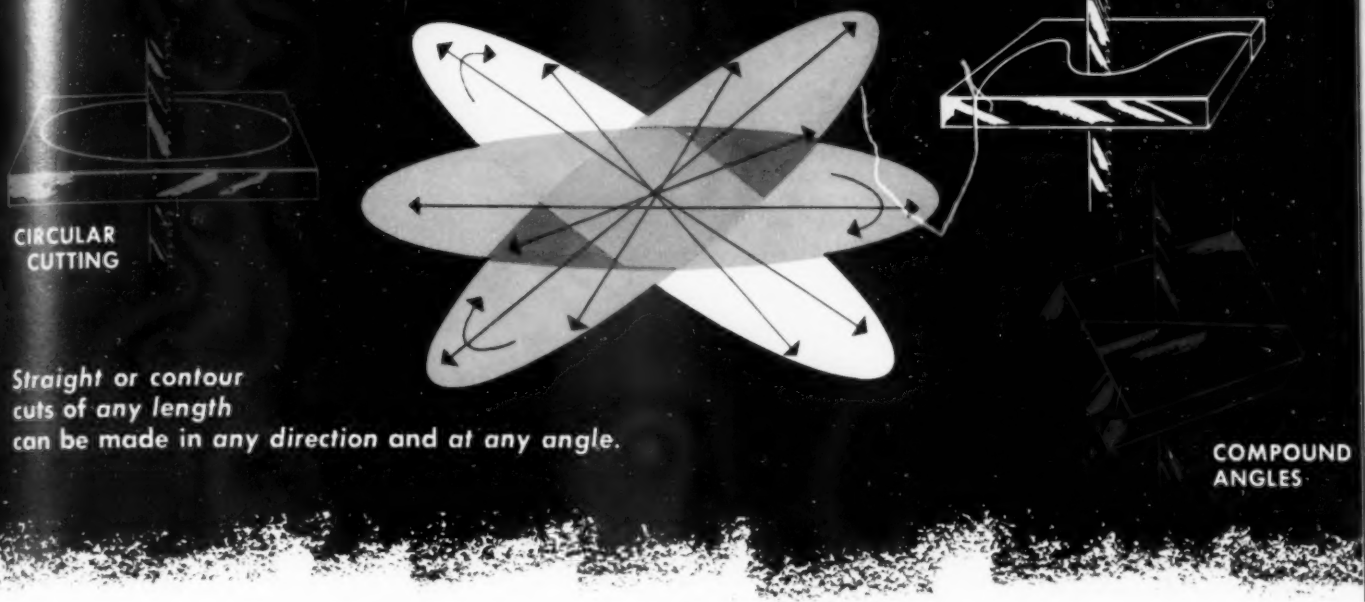
THEN . . . The DoALL metal cutting band saw.

NOW . . . A complete remote control power feed machine tool using a continuous band cutting tool.

All this in just 22 years . . . fastest basic machine tool development in history . . . and the most versatile machine tool ever developed.

and Machine Reduces Costs

BUT WITH A DoALL BAND MACHINE . . .



Straight or contour cuts of any length can be made in any direction and at any angle.

Why You Can Produce More—

faster and at lower cost with a DoALL band machine

Plants that have applied band machining to production machining have experienced cost reductions ranging from 10% to 90% as compared to the costs on other machine tools. Here are some of the reasons for these remarkable savings:

CUTS FASTER! Because it is thin, has many teeth (1500 or more) cuts continuously and runs at relatively high velocities, the band tool penetrates material faster. Cutting only a narrow slot, the tool "slices" through work, removes an entire section of metal intact instead of slowly nibbling it down into a pile of chips. *(Friction sawing speeds range up to 15,000 blade feet per minute!)*

LOW COST TOOLS! DoALL Band Tools, especially the amazing Demon High-Speed Steel Band, will machine up to 10,000 square inches of mild steel at 10 square inches per minute. In terms of work output per hour, no other cutting tool can compare!

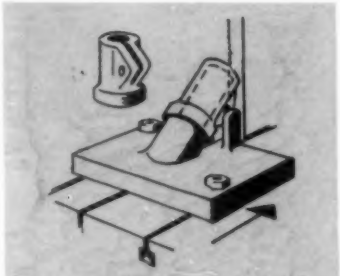
FIXTURING IS SIMPLER! Cutting force is in the direction of the table. Back-up bars or other simple, low cost fixtures are all that are required to hold work in position as the power feed table carries it into the blade for straight cuts. Fixtures often cost but 1/10 to 1/2 of those for other machine tools. Many can be improvised in a short time.

LESS SET-UP TIME! The simple fixturing permits the operator to set-up his work in a fraction of the time often required on other machines.

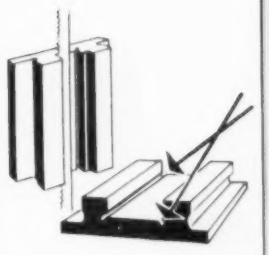
DOES MORE JOBS! The versatility of the band machine increases its usefulness, keeps it on the go, increases return on investment.

SAVES MATERIAL! In many cases, the sections of costly material saved by band machining can be salvaged for other uses.

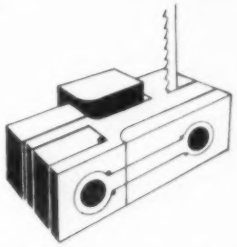
COSTS LESS! A new power-feed DoALL Band Machine often costs but 1/3 to 1/2 as much as other machine tools previously used for many of the same machining operations.



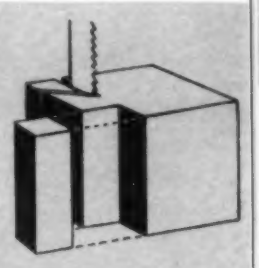
Power feed slotting with simple fixture.



Time-saving cutting of grindin reliefs.

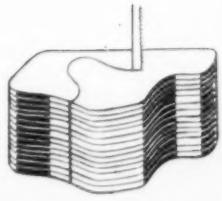


3-dimensional cutting without stock waste.



Notching operations done faste

Mass production splitting operation.



Multiple cutting in heights 10" and more.

PROOF . . . FACTS . . . FIGURES

. . . *see the next page* →

Look At These Savings!

SAVES 33 HOURS and $190 TOOL COST—Slots band machined in 1½ ton #4140 forging in 3 hours at a tool cost of $10 per piece. Formerly cut on $25,000 slotter in 36 hours at a tool cost of $200 per piece.

66% SAVING—Rapid trimming with excellent finish by band machining results in 66% saving over former milling operation.

15 TIMES FASTER—Bearings split in 40 seconds on band machine using simple 180° indexing fixture. Former milling time was 10 minutes each.

SECTION REMOVED WHOLE IN 7.8 MINUTES—Steel forging SAE 4340. Nature of task excludes all methods but band machining for speed and efficiency.

FAST ANGLE CUT — NO FIXTURING COST 45 degree cut made on band machine in .25 minutes using simple vise as fixture.

96% SAVING—High temperature fan nickel-chrome steel blades are trimmed to length on band machine with 96% saving over mill. Only a simple index fixture required.

SEE A DEMONSTRATION —

You can see this new machining method without obligation at your own plant. Call your local DoALL Store, or write: The DoALL Company, Des Plaines, Ill.

SEE NEW FILMS—two new sound color films available for group showings:

1. "Production Band Machining"—30 minutes.
2. "Production Tooling"—10 minutes.

. . . revealing the newest concept for cost-reductions in machining. Call your local DoALL Store or write, The DoALL Company, Des Plaines, Illinois.

DoALL

Friendly DoAll Stores . . . (in 37 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

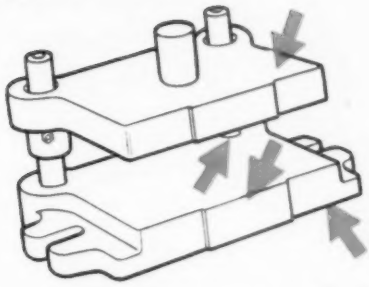
Call Your DoALL Service-Store
DoALL
SAW BANDS
DoALL GAGE BLOCKS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.

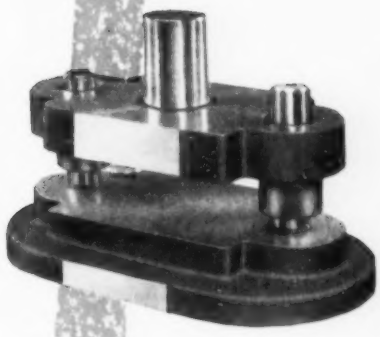
EDUCATIONAL STUDY WALL CHARTS

Economic Principles

$1.00 each postpaid

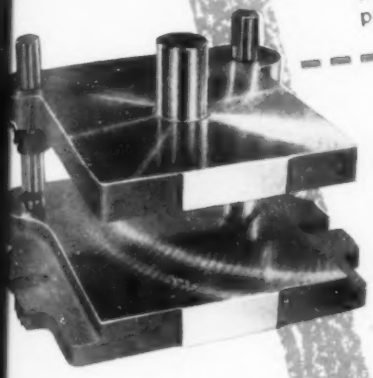
Lower quantity prices

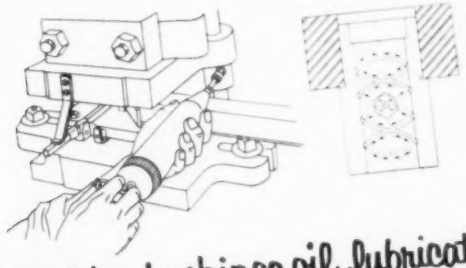




all horizontal surfaces ground

Now, in addition to the vital die surfaces of all steel or semi-steel sets, all horizontal surfaces, including tops of punch holders, are ground with the same precision that has made Danly quality the accepted standard. Surface grinding assures a flat, true working surface, saves tooling time and improves accuracy.





Shoulder bushings oil lubricated

All Danly Standard Sets equipped with shoulder bushings are designed for easy, pressurized oil lubrication. Fittings in bushing shoulder are easily reached from front or side. Cut-away sketch shows oil channels in bushing that form lubrication reservoir for long runs and maintain oil film with a minimum of clogging or gumming.

New features like these keep DANLY ahead

Throughout the years, the rigid precision standards of Danly have made Danly Die Sets the recognized standard for quality. Now Danly Die Sets offer you two new features to save hours in the die shop, make tooling-up much faster and assure longer die life. All new Danly Die Sets have an oil lubrication system for shoulder bushings and all horizontal surfaces are ground to assure a true working surface for die making. Danly's nationwide system of assembly branches is ready to serve you. Call Danly today.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

HERE ARE THE DANLY PLANTS THAT SERVE YOU

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
1549 Temple Avenue

GRAND RAPIDS
113 Michigan Street, N.W.

INDIANAPOLIS 4
5 West 10th Street

LONG ISLAND CITY 1
47-28 37th Street

LOS ANGELES 54
Ducommun Metals & Supply Co.
4890 South Alameda

MILWAUKEE 2
111 E. Wisconsin Avenue

PHILADELPHIA 40
511 W. Courtland Street

ROCHESTER 6
33 Rutter Street

ST. LOUIS 8
3740 Washington Blvd.

SYRACUSE 4
2005 West Genesee Street

DANLY

There's a Standard **PUTNAM END MILL** *for Your Job!*

Universal Application of Putnam End Mills (there are over 1200 standard sizes and types) permits users to select a standard end mill specifically designed for each job.

Many standard Putnam End Mills are of a type considered "specials" by other manufacturers. Also, a wide range of sizes are available in every standard type of end mill to provide complete application coverage.

From smallest to largest sizes—from fine intricate machining to rugged milling operations there is probably a standard Putnam End Mill that will mill your job more efficiently. However, Putnam will also produce "special" end mills to your specs for those extra-special applications.

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVE. • DETROIT 7, MICH.

THE

new

SELLERS 6-GA DRILL GRINDER

Grinds faster and handles easier. And it can also be arranged to grind carbide drills.

Capacity: 5/16″ to 3″ drills

CONSOLIDATED MACHINE TOOL CO.

ROCHESTER, NEW YORK

CONSOLIDATED MACHINE TOOLS

A DIVISION OF FARREL-BIRMINGHAM CO., INC.

F/B

it's the greatest advancement in OBI press history

NIAGARA FRONT-TO-BACK

ALL NEW rugged, front-to-back crankshaft with huge crankpins
ALL NEW compact, fully concealed driving mechanism
ALL NEW enclosed, rigidly supported gearing in sealed oil bath
ALL NEW electro-pneumatic friction clutch on crankshaft
ALL NEW wider spaced, longer, narrower gibs
ALL NEW wider, box type slide all within gibbing
ALL NEW precision, hardened, longer-wearing gears
ALL NEW compact, straight-line, space-saving frame

PROPERTIES OF KENNAMETAL DIE GRADES

Hailed as the greatest achievement in modern OBI press design and performance, by over 100,000 spectators who examined this mechanical marvel at the Machine Tool Show, the all-new Niagara Series E, Single Point, Open Back Inclinable Press starts a brand new chapter in press history.

It's years ahead of any OBI ever built. It's an industrial revolution all by itself. No other press, in modern times, embraces so many "All-New" features.

Gone are exposed, overhanging gears, flywheel and other mechanisms. Gone is excessive and damaging crankshaft deflection. Here to stay are: Full support to wide dies. Greater resistance to off-center loading. Accurate alignment of slide, with minimized tendency to cock. Substantially increased die life. Longer lasting, hardened gears. Smoother, safer press performance. Smaller floorspace requirements.

Built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons, the new Series E is available in both standard models and automation models equipped with the most advanced controls and devices for peak production. A complete description of both, with full specifications, is given in new Bulletin 56, sent promptly on request.

SEND FOR NEW BULLETIN . . .

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries.

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work.

K CRANKSHAFT-OBI PRESS DESIGN

STANDARD DESIGN
For General Purpose Production

MODIFIED DESIGN
For Automation Lines

PROPERTIES OF KENNAMETAL DIE GRADES

Grade	Hardness (Rockwell A)	Transverse Rupture psi	Young's Modulus of Elasticity psi	Compressive Strength psi	Suggested Applications
K82 K84 K86	90.0 91.0 91.5	275,000 300,000 250,000	65,500,000 74,000,000 72,000,000	663,000 600,000 590,000	Draw dies (all sizes) for drawing tubes, bars and wire; for cupping and deep drawing.
K90	85.0	360,000	61,600,000	518,000	Heavy blanking dies up to 3/16" steel. Dies for: cold-heading, nail gripping, nibbling, swaging steel rods, heavy curling, coining.
K91	86.5	380,000	64,400,000	540,000	Light-heavy blanking up to 1/16" steel; rivet sets, crushing hammers, washer dies.
K92	87.5	385,000	71,900,000	572,000	Lamination dies on .004" to .035" silicon steel; medium blanking dies softer metals up to .040"; heavy forming dies; heavy heading machine hammers; hardware curling dies.
K94	90.0	325,000	77,900,000	600,000	Tube swaging dies; light blanking up to .020" silicon steel; medium blanking, softer metals up to .040"; heavy forging dies; heavy heading machine hammers; curling dies for hardware.
K95	90.5	300,000	82,000,000	644,000	Light blanking up to .015" silicon steel; light heading hammers; wear-resistant parts.
K96	92.0	250,000	94,300,000	800,000	Dies for asphalt floor tile; slate-covered asbestos shingles; abrasive-covered roofing papers; and in the paper industry for slitter knives and plates; blanking and pressing dies; compacting dies for powder metallurgy, wear-resistant parts.

You can select the right grade of Kennametal* for each specific die requirement

With six grades in the "90 series" and three grades in the "80 series," Kennametal offers the right grade for any die application. The 90 series covers the full range of tungsten carbide grade requirements—from K90 with exceptional strength for heavy operations to K96 with maximum resistance to wear for such jobs as compacting and cutting highly abrasive materials.

In the 80 series, Kennametal offers three exclusive grades with unique properties not found in any other carbide. These three $WTiC_2$ grades, with a special slippery quality, have been created especially for drawing, forming and sizing operations where the slightest amount of galling or pickup cannot be tolerated.

From these two groups you can select the right grade for each specific job to assure highest production rates, to reduce die cost and maintenance, and provide products of uniformly accurate dimension and finish. Kennametal die engineers will gladly work with you in analyzing your die operations. They can show you performance reports on Kennametal over a wide range of applications—many of which may be similar to your operations. Call your nearest Kennametal office or write us direct. If you wish more information, send for Booklet B-100 and a copy of our new die grade selection chart. Kennametal Inc., Latrobe, Pa.

*Registered Trademark

Use Kennametal Die Grades for blanking, stamping, compacting, perforating, cold heading, swaging, forming, cupping, drawing. Illustrations show a few of the many types of die parts made of Kennametal for producing a diversification of shapes to exact tolerances with a minimum of finish grinding.

7299

INDUSTRY AND **KENNAMETAL** ...Partners in Progress

New 6" x 18" hand feed

Thompson Grinder

FOR SHOPWORK
OR TOOL ROOM

Completely anti-friction and permanently lubricated machine. Available with all types of attachments found on tool room surface grinders including interchangeable horizontal and vertical wheel heads. A Thompson high quality precision machine at this low price.

ONLY
$2,500*

PRECISION PETE says:

FOR LOW COST AND QUALITY YOU JUST CAN'T BEAT THOMPSON
Make your next hand feed grinder a Type D Thompson . . . write today for the new descriptive catalog, D-55

* Price F.O.B. Springfield, Ohio U.S.A., Subject to Change Without Notice.

Call, write or wire today

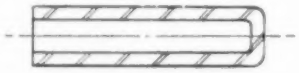
Thompson Grinders

The Thompson Grinder Company at Springfield, Ohio

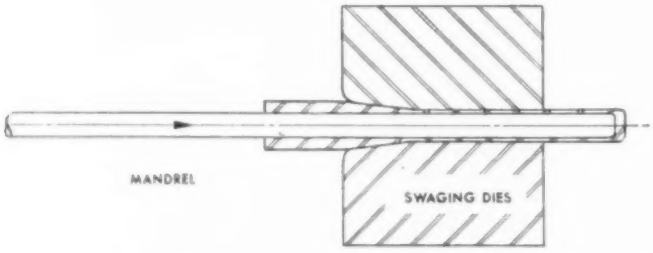
Swaging Success Stories

Fabricating long, thin-walled cups... by Mandrel Swaging

This extra deep, thin-walled cup would be impossible to make by the usual method of deep drawing in a press. But swaging provides an easy solution to the problem.



A cup is drawn having the same volume of metal in the wall as the desired finished cup.



By swaging the drawn cup over a hardened mandrel, the wall is thinned and the cup lengthened to required proportions.

Look at the possibilities swaging holds for you!

1. Fast—can be performed by unskilled workers to produce more pieces at lower cost.

2. Economical—saves on skilled labor and material . . . no chips, no waste, no scrap.

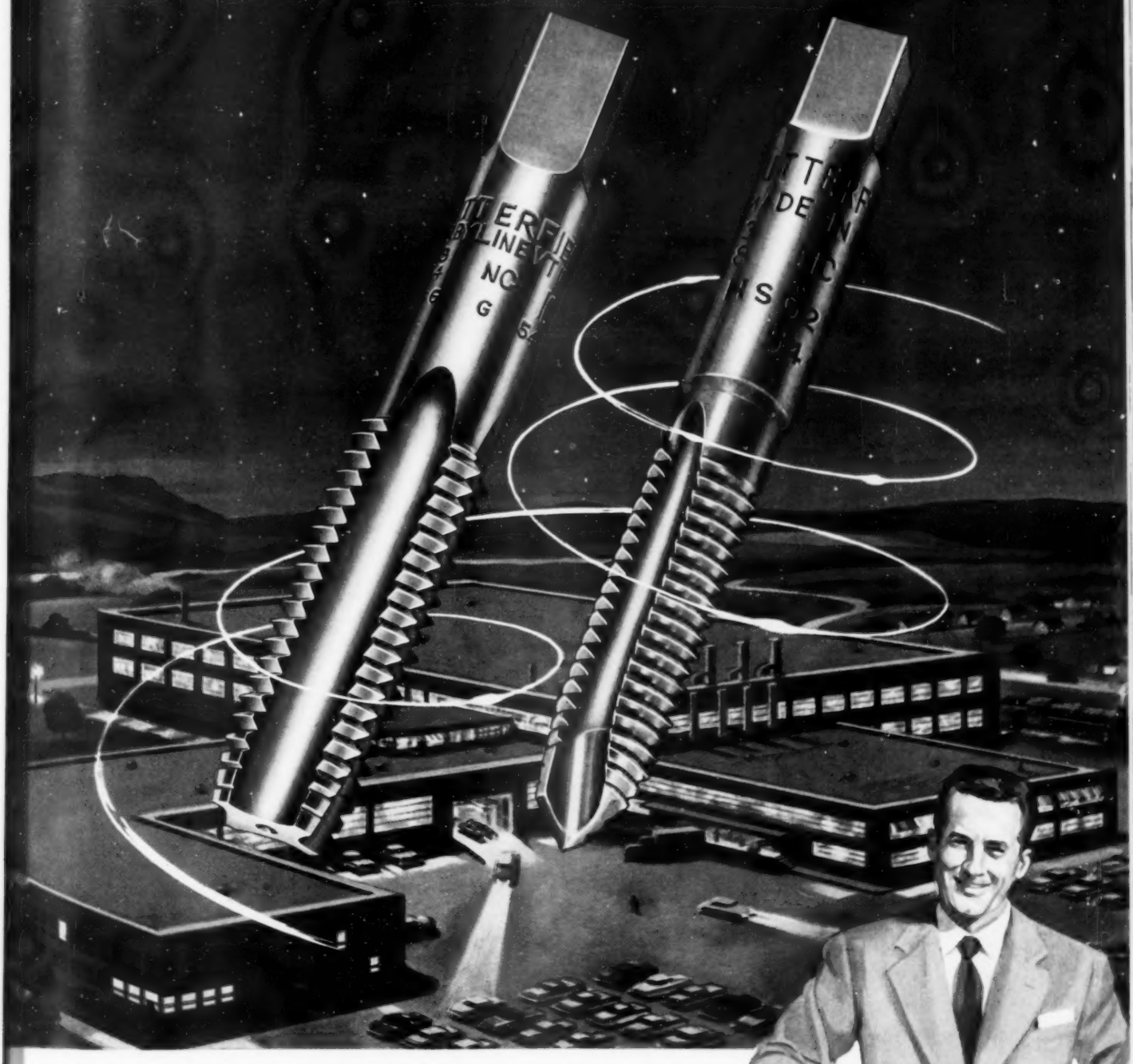
3. Accurate—hardens metal to give it added strength, better finish and dimensional accuracy.

Write for our informative booklet on swaging. Our detailed descriptions of Torrington Rotary Swagers and their capabilities may start you on the road to your own "Swaging Success Story."

THE TORRINGTON COMPANY
Swaging Machine Division
444 North Street, Torrington, Conn.
Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

BUTTERFIELD



A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Taps are made to the same exacting standards as Butterfield Milling Cutters, Dies, Drills, Reamers, Counterbores and End mills.

UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U.S.A.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD** DISTRIBUTOR

dynamic

NEW

advance

in

milling

versatility...

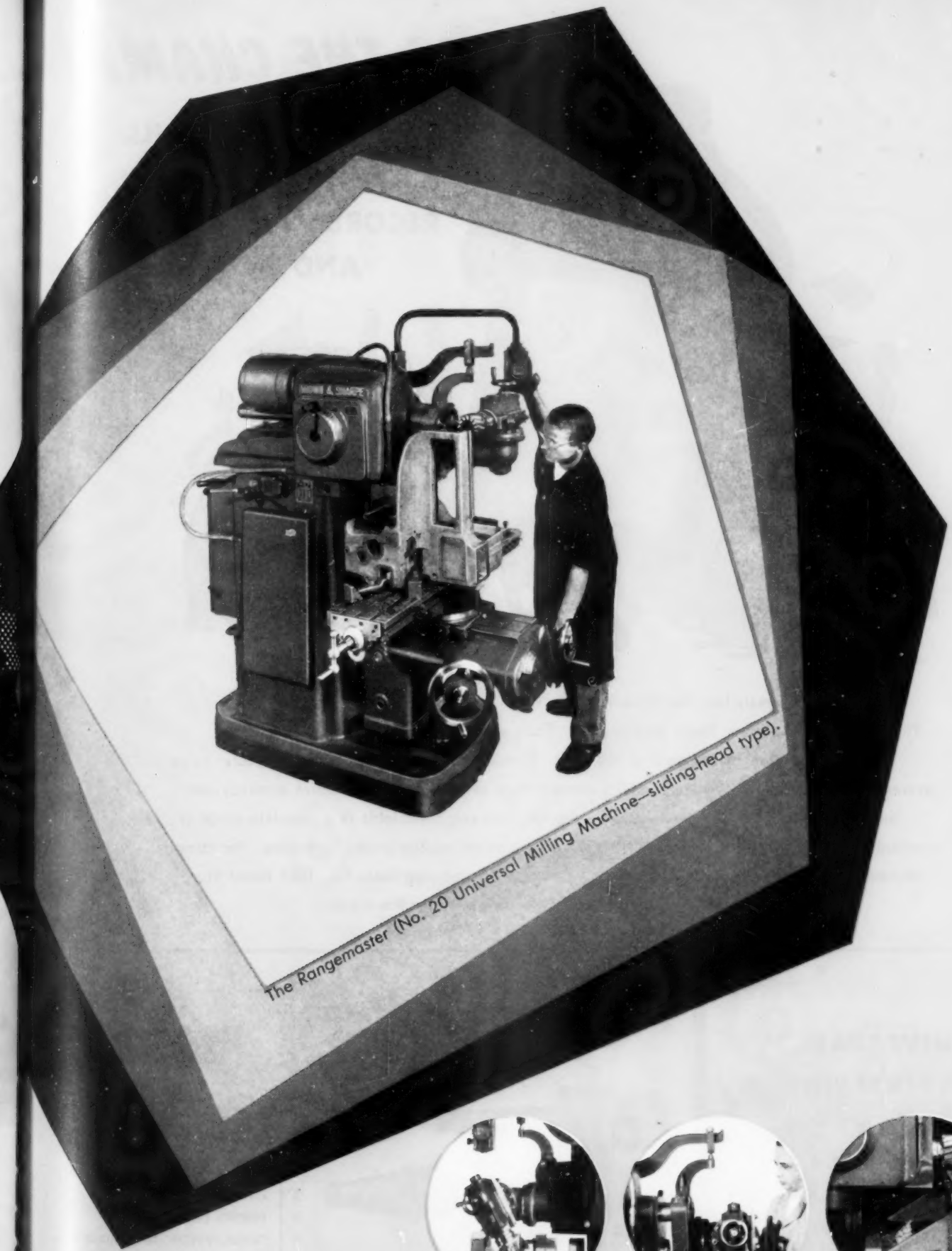
the

RANGEMASTER

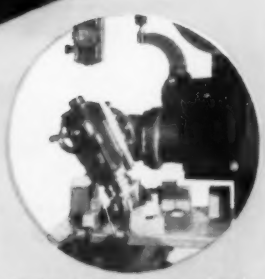
Now the new Brown & Sharpe *Rangemaster* provides work-range and milling flexibility unmatched by any other single machine! Saves tremendously on set-ups — especially for multi-surface milling jobs. Permits fast, easy changes from horizontal to vertical and angular milling. Both spindles utilize full power on all work; vertical spindle has 18 speed changes from 80 to 3060 rpm. Exclusive features: Quill feed and universal head movement give 360° range in two planes without extra attachment. Both spindles on same vertical centerline. Massive ways, 22" wide, for sliding head. Sustained high-accuracy milling in any work position! Available as universal or plain milling machine. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, R. I.

RANGEMASTER'S UNIQUE RANGE

28" table travel • 12" transverse feed
22⅞" sliding head movement • 20¼" vertical feed
3½" hand movement of quill in universal head

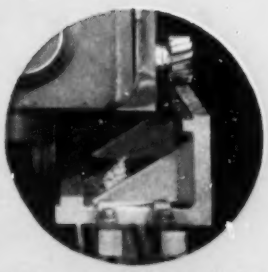


The Rangemaster (No. 20 Universal Milling Machine—sliding-head type).



Horizontal, vertical, or angular milling quickly available with full 3 h.p. at spindle.

Universal head permanently mounted on crane—swings completely out of way when not in use. Both spindles always at ideal height for fast set-up and easy operation.



Full use of table travel plus exceptional sliding head range permits milling of many multi-surface jobs with only one work set-up.

Brown & Sharpe

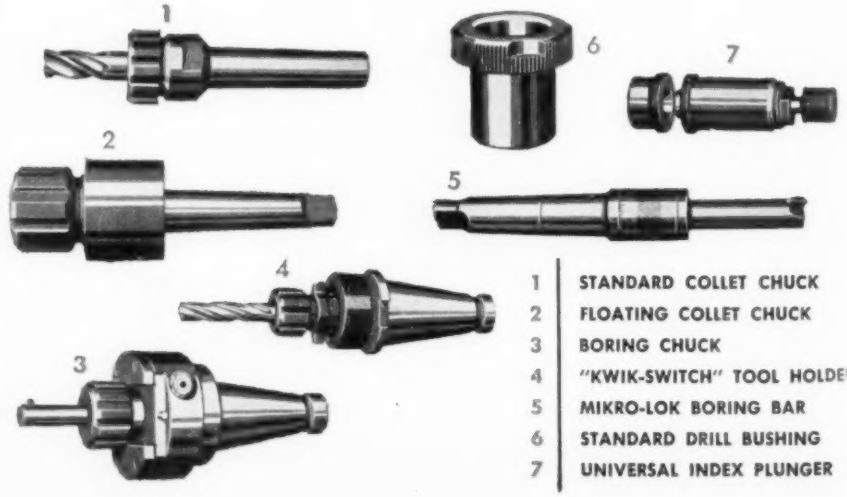
MEET THE CHAMP!

UNIVERSAL DRILL BUSHINGS BEAT ALL RECORDS FOR LONG LIFE AND ACCURACY

The extremely long life of Universal Drill Bushings is due to several factors. They are machined from finest quality steel. Their superfinish bores help to reduce both wear of the bushing and wear of the tools. Blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

179

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 3
MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

... make tracks

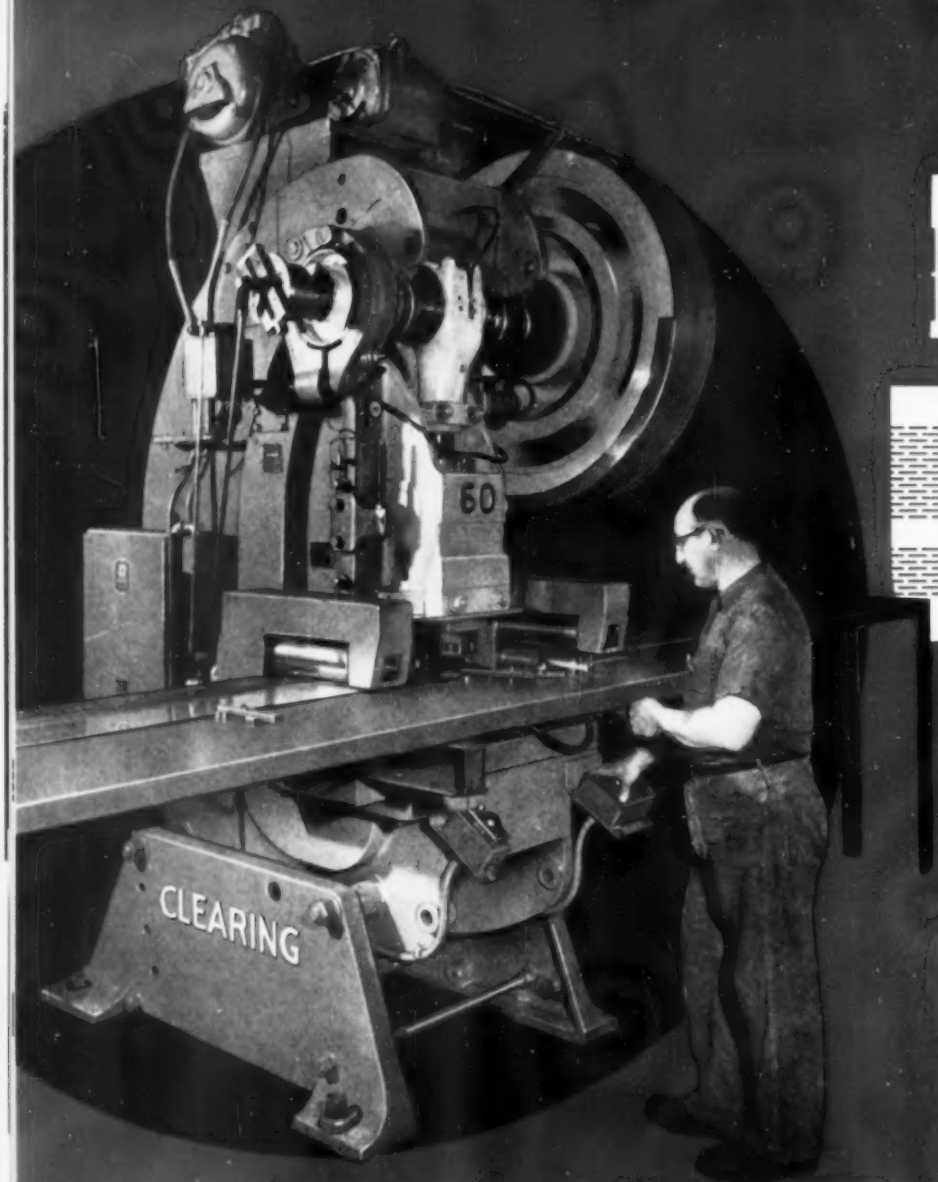
TO YOUR

Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.



high production–60 tons' worth

Here's a story for Clearing O.B.I. that's really pulling all its weight at the Hussmann Refrigerator Company in St. Louis. Hussmann required a variety of patterns in ventilator panels for their line of commercial refrigerators. Instead of making each panel separately, they produce a continuous pattern from automatically fed strip stock. Simple die changes make it possible to change the pattern easily and quickly. An open end roll feed and vari-speed drive on the press gets top output out of every working hour.

There's a way that the efficiency of a Clearing O.B.I. can solve a production problem for you. It gives you the kind of smooth operation your operators will go for and the ruggedness that comes through for you in the pinches. We'd be glad to talk to you personally about these things. Why not call us?

Write for your copy of Clearing's O.B.I. catalog. We'll send it promptly at no obligation.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

DIVISION OF U. S. INDUSTRIES, INC. 6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS • HAMILTON PLANT—HAMILTON, OHIO

Officers

H. B. Osborn, Jr.
President
Cleveland, Ohio

Howard C. McMillen
Vice-President
Bedford, Ind.

Harold E. Collins
Vice-President
Houston, Texas

Raymond C. W. Peterson
Vice-President
Toledo, Ohio

Wayne Ewing
Vice-President
Los Angeles, Calif.

Harold Dale Long
Treasurer
Chicago, Ill.

John X. Ryneska
Secretary
Lynn, Mass.

Harry E. Conrad
Executive Secretary
Detroit, Mich.

Allan Ray Putnam
Asst. Executive Secretary
Detroit, Mich.

Board of Directors

H. B. Osborn, Jr., *Chairman*
Cleveland, Ohio

A. B. Clark
Cleveland, Ohio

H. L. Collins
Houston, Texas

J. P. Crosby
Lexington, Mass.

W. G. Ehrhardt
St. Louis, Mo.

Wayne Ewing
Los Angeles, Calif.

G. A. Goodwin
Dayton, Ohio

J. O. Horne
Rochester, N. Y.

H. Dale Long
Chicago, Ill.

H. C. McMillen
Bedford, Ind.

Wm. Moreland
Ashland, Ohio

R. C. W. Peterson
Toledo, Ohio

C. M. Smillie
Detroit, Mich.

R. A. Smith
W. Hartford, Conn.

W. A. Thomas
Windsor, Ontario

Editorial Committee

Joseph L. Petz, *Chairman*
Poughkeepsie, N. Y.

Ben B. Berlien, *Vice-Chairman*
Oakland, Calif.

Lee M. Davis
Springfield, Vt.

Harold W. Hagle
Wesleyville, Pa.

Ralph F. Mueller
St. Louis, Mo.

Donald E. Wernz
Baltimore, Md.

Donald E. Zierk
Dundee, Ill.

The Tool Engineer

It Can Still Happen Here!

Increased productivity is a sure-fire treatment that any country may apply to improve its economic condition. Extensive use of automation continues to improve the standard of living in this country and, reluctantly, even labor is agreeing that the unemployment bogey-man doesn't necessarily come with it. But across the pond the average British worker believes in the bogey-man and finds it difficult to accept automation. As a result, he is fighting it every step of the way. Feather-bedding is rampant.

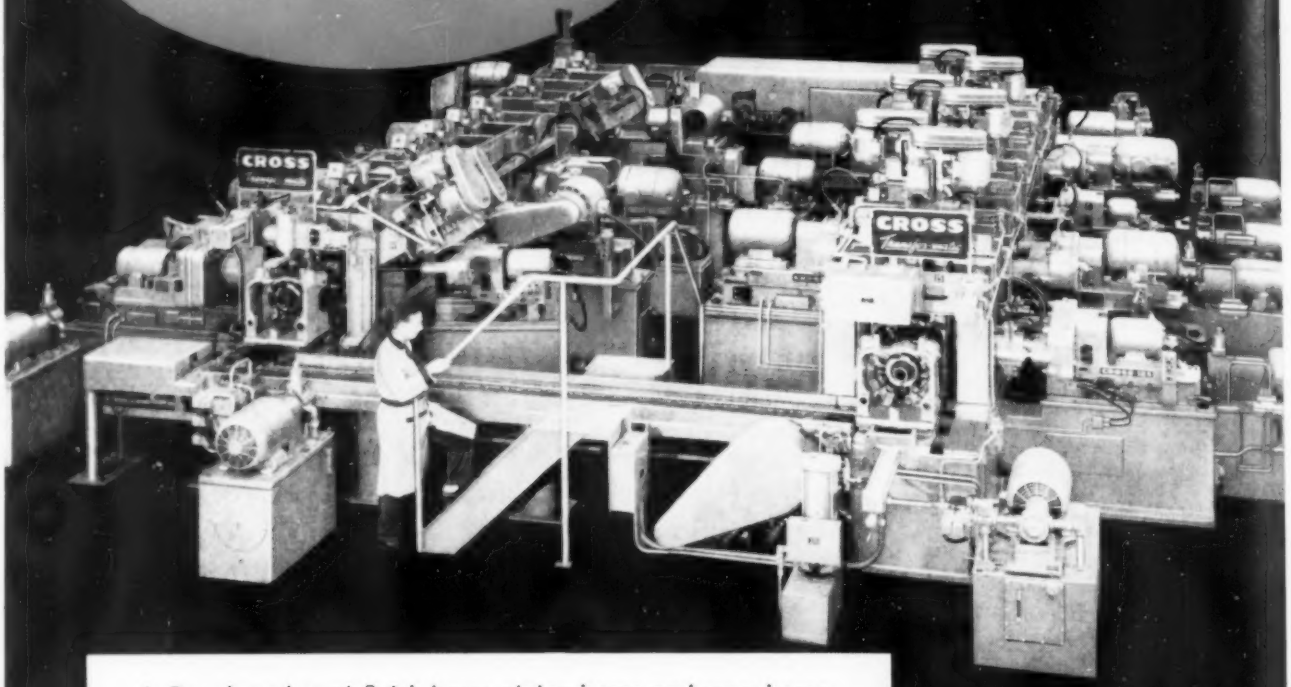
The keen competition apparent in this country in certain fields—automobile manufacturing for example—spurs American industry on to greater production efforts (witness recent announcements of new plants). We may soon find not enough customers to purchase the goods produced regardless of their value. When that happens, beware. There is no real guarantee of employment. Labor may protect itself in the only way it knows—to limit production regardless of the terms of its contract with management. It can happen here, too.

H. B. Osborn Jr.

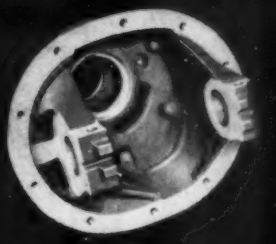
PRESIDENT

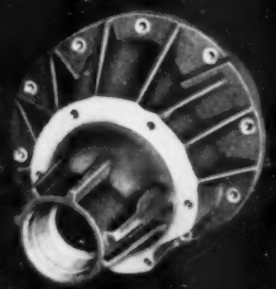
Mills, Drills, Bores, Turns Differential Gear Carriers

Another Transfer-matic by Cross



- ★ Rough and semi-finish bores pinion bores and cross bores; rough and finish faces and turns pilot diameter of torque tube flange; mills faces of cross bore bosses; spotfaces flange mounting holes; drills, chamfers, reams and taps all other holes except flange holes.
- ★ 115 pieces per hour at 100% efficiency.
- ★ 73 operations: 8 milling, 8 boring, 2 crossfacing, 1 turning, 18 drilling, 10 spotfacing, 7 chamfering, 2 reaming, 9 tapping, 8 probing.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Palletized work holding fixtures with hydraulically operated torque wrenches for clamping and unclamping parts.
- ★ Washing and drying unit for cleaning fixtures between last cutting station and loading station.
- ★ Other features: Construction to J.I.C. standards; hardened and ground ways; hydraulic feed and rapid traverse; automatic lubrication system.





Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

optical trueing of lathes saves time

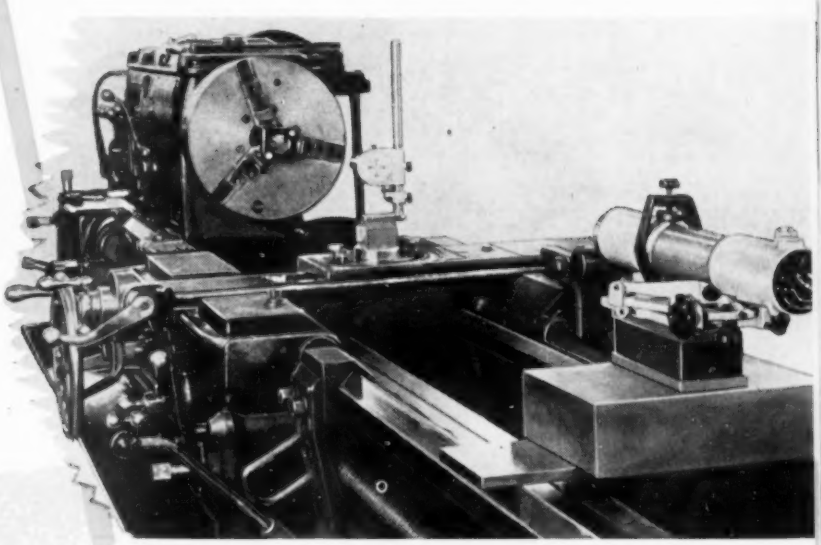


Fig. 1. Arrangement for measuring lathe bed errors. Setup includes alignment telescope, spindle mirror and target.

By Earle B. Brown

Chief Project Engineer
Farrand Optical Co., Inc.,
New York, N. Y.

Optical tooling offers simple and accurate means of aligning and adjusting many types of machine tools. The method for trueing lathes described utilizes standard equipment, which determines alignment of ways to an accuracy of plus or minus 2 seconds of arc and measures lack of straightness to 0.001 inch or finer.

DEVELOPED IN THE AIRCRAFT industry primarily for large assembly fixtures, optical methods are now being adapted to more general tooling. Optical methods are finding application in various industries, particularly for alignment of machine tools.

Recent applications of optical methods are exemplified by the trueing of lathes, *Fig.* 1. This technique provides simple and accurate measurement of the straightness of the ways, including their parallelism with the spindle axis of rotation, and the straightness of the cross-slide motion and its perpendicularity to the spindle axis. The procedure is simple. Highly accurate measurements for a large lathe may be made in less than an hour.

The fundamental principle underlying optical alignment is the fact that a ray of light is an excellent straight line; it does not warp, sag or become

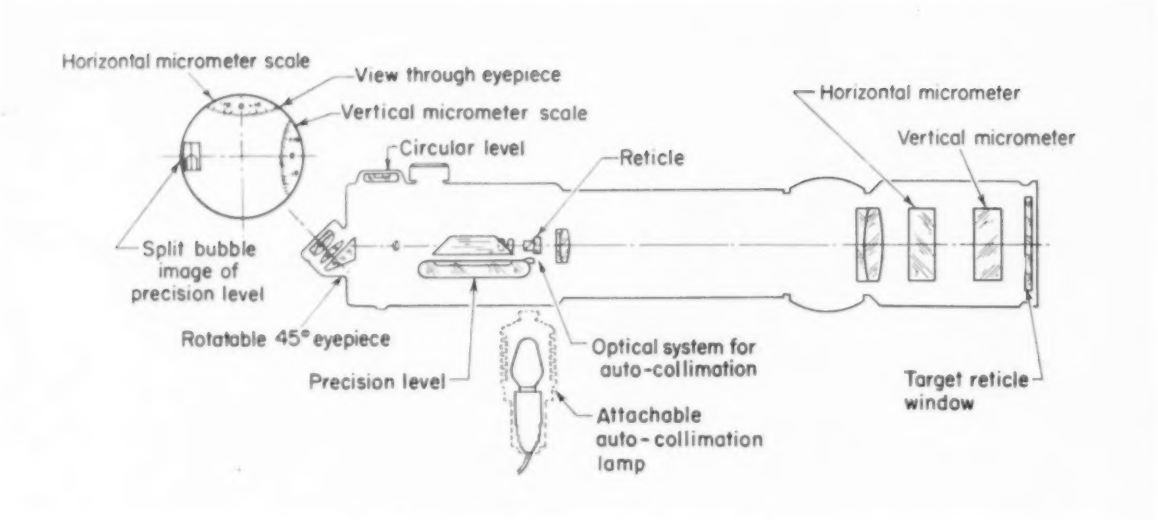


Fig. 2. Schematic diagram of alignment telescope.

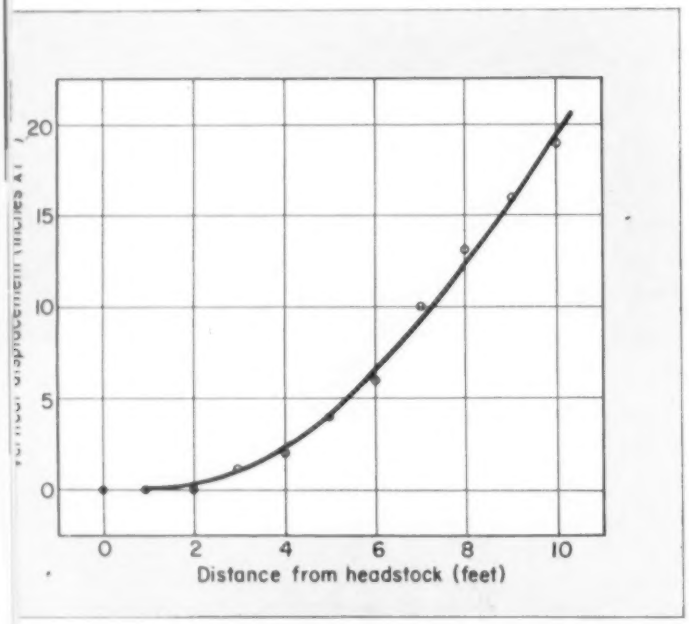


Fig. 3. Error measurements of a typical lathe. Only vertical readings of lathe bed are shown.

damaged. The light ray which provides the standard for measurement in optical tooling techniques is the optical axis of a high-power, accurate alignment telescope. A schematic diagram of such an instrument is shown in *Fig.* 2. The alignment telescope is a combined sighting telescope and autocollimator. Autocollimation is the method by which the telescope is initially aligned and will be described later.

In the design shown, deviation measurements may be made directly in thousandths of an inch by rotation of the horizontal and vertical micrometer flats. These are located immediately behind the target reticle window. These flats displace the projected optical axis of the instrument parallel to itself. Thus, they provide measurements directly in linear displacement regardless of the distance to the point being measured. This is much more convenient than an angular measurement for many purposes.

In detail, linear displacements are measured as follows: The observed image of a target is compared with the reticle cross lines of the alignment telescope. Next, the micrometers are adjusted until the reticle and the image coincide. Then the scale reading in the eyepiece indicates the displacement of the target center from the projected optical axis of the telescope.

Principles of Application

This equipment is readily applied to trueing lathes. An over-all description of the procedure will be given first to indicate general principles. The initial step is to set an alignment telescope so that its optical axis is parallel to the axis of rotation of the lathe spindle and approximately on the same center line. This is done by autocollimation.

A crossline target is set up on the lathe carriage so that its center is on the optical axis of the telescope for some arbitrary longitudinal zero position of the carriage. The carriage is then moved along the ways and the displacement of the target center from the telescope axis is measured at whatever number of points is considered sufficient. These displacement measurements may be plotted against carriage position on graphs—one for lateral displacements and another for vertical displacements.

Deviation of the resultant curves from straight lines indicates lack of straightness of the ways. Similarly, slope of the curve with respect to the horizontal indicates lack of parallelism of the ways to the spindle axis of rotation. A typical curve from an actual measurement appears in *Fig.* 3.

This curve indicates a deviation from straightness

of the ways in the order of several thousandths of an inch and an inclination of the ways to the axis of about 30 seconds of arc. From the form of the curve it may readily be inferred that the jackscrews at the tailstock end of the bed are set too high. For this particular machine two adjustments to the jackscrews, each followed by a series of optical measurements, reduced the error to a maximum of 0.001 inch over the ten-foot length of bed.

For checking alignment of the cross-feed, the alignment telescope is set perpendicular to the lathe axis of rotation. A target is mounted on the cross-feed and centered on the telescope optical axis. Again, a series of measurements is made with the cross-feed in successive positions along its range. The usual procedure followed, as described in detail in succeeding paragraph, permits only measurement of lateral errors of cross-feed travel, making no provision for direct measurement of vertical errors. However, small vertical errors of the cross-feed are usually unimportant. This type of error can be measured, when desirable, by using a more refined procedure for setting the telescope.

As previously indicated, the alignment telescope is set parallel or perpendicular to the lathe rotational axis by autocollimation. The principle of autocollimation is illustrated in *Fig.* 4. A means is provided in the alignment telescope for illuminating the reticle. The objective of the telescope then projects the image of this illuminated reticle at infinity in the manner of a collimator. Outgoing light is reflected from a flat mirror. When the telescope is focussed for infinity, the reflected image is formed in the original focal plane where its position can be compared with that of the reticle.

If the flat mirror is oriented perpendicular to the optical axis of the telescope, the reticle and its image will superimpose; if the mirror is not perpendicular, the reflected image will be displaced with respect to the original reticle. This is a precise method for setting a flat surface perpendicular to the optical axis of a telescope or vice versa. The method is used extensively in many applications.

For trueing lathes, a flat mirror is mounted in the headstock of the lathe, perpendicular to the axis of rotation. This can be accomplished by facing off a piece of stock and, without removing the piece from the lathe, mounting the flat mirror on it. Adjustable mirrors are available with magnetic mounts for this purpose.

Since the stock will not be faced off flat when the cross-feed is out of true, the spindle mirror will be slightly tilted. This condition may be corrected by shimming. The presence of tilt is shown in the telescope by a rotary movement of the reflected image when the headstock is rotated. If the mirror is perpendicular to the axis, the image will stand still as the mirror is rotated. If the tilt is slight, the telescope may be aligned to the center of the circle of image rotation. The alignment telescope is then adjusted so that the reflected reticle image coincides with the reticle.

This requires only angular adjustment of the telescope if it has been set reasonably close to the

Fig. 5. Autocollimating for cross-feed alignment check. Arrangement includes alignment telescope, spindle mirror and optical square.

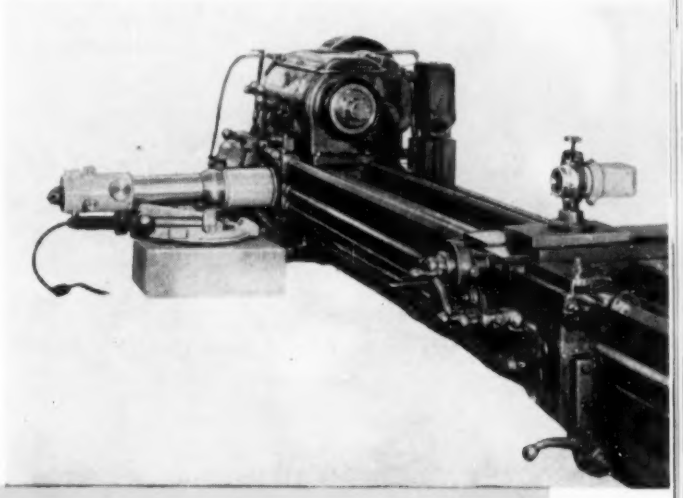
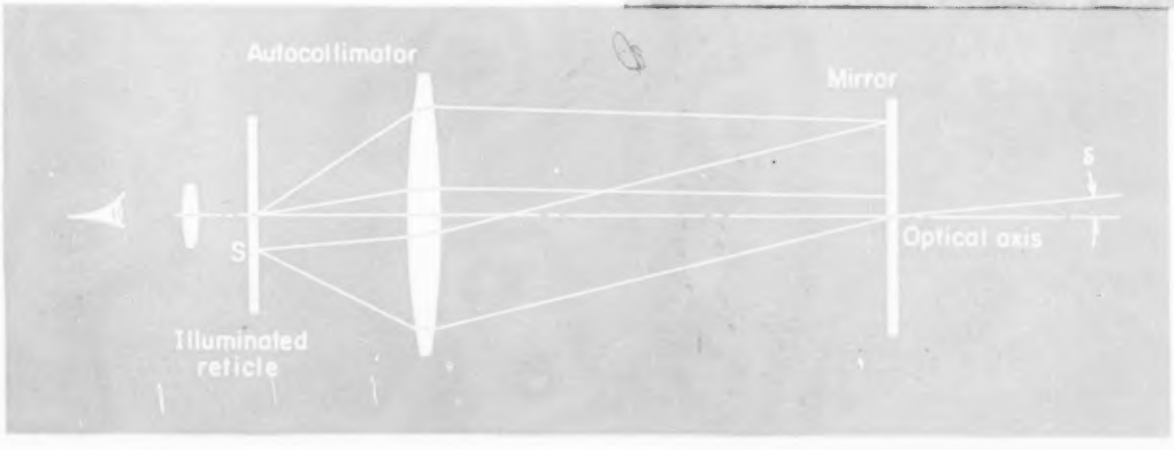


Fig. 4. Schematic diagram showing principle of autocollimation.



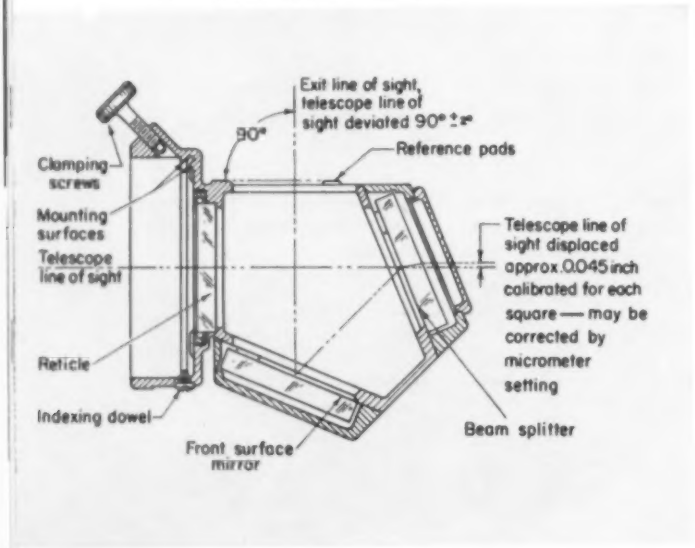
lathe axis by visual inspection. It is not necessary that the optical axis coincide with the lathe axis—only that they be parallel.

The next step is to set a target on the carriage in such a way that its vertical height may be adjusted. Usually the target is set up with the carriage close to the headstock. By means of the target adjustment and the cross-feed travel, the target is brought into the line of sight of the telescope. Of course the telescope must be refocussed from infinity to the distance of the target. Precision construction of the alignment telescope is especially important in this operation.

With these preliminary arrangements completed, readings can be taken of target displacement at various points along the bed. The telescope is refocussed and micrometer adjustments are made to obtain readings. *Fig.* 1 pictures a lathe set up for optical trueing in the manner described.

Once the bed has been checked and adjusted, the alignment telescope is moved to a position in front of the cross-feed, *Fig.* 5. An optical square is placed on the toolholder and adjusted approximately on the lathe spindle axis. The optical square, *Fig.* 6, is a precision penta mirror assembly which bends the line of sight 90 deg.

Fig. 6. Cross section drawing of an optical square showing principle of operation.


Exit line of sight, telescope line of sight deviated 90° ±2"
90°
Reference pads
Clamping screws
Mounting surfaces
Telescope line of sight
Telescope line of sight displaced approx.0.045 inch calibrated for each square — may be corrected by micrometer setting
Reticle
Indexing dowel
Front surface mirror
Beam splitter

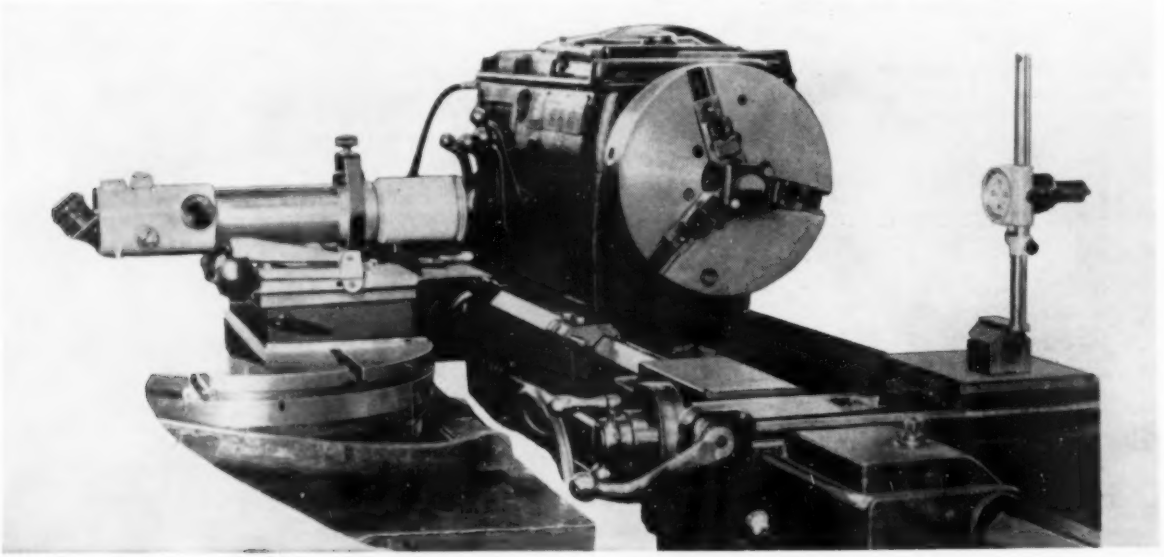
Details of Cross-Feed Check

With this arrangement, the alignment telescope is adjusted perpendicular to the lathe spindle axis by autocollimation from the spindle mirror, sighting through the optical square, *Fig.* 6. When the optical square is placed in position on the toolholder, it is adjusted approximately level, that is, with the entrance face nearest the telescope approximately perpendicular, but no precise adjustment is made for possible rotation about the lathe spindle axis. This obviates the possibility of checking vertical errors of the cross-feed. Straightness of the cross-feed ways in the vertical plane may, however, be checked.

After the alignment operation, the optical square is replaced with a target, which is adjusted to the optical axis of the alignment telescope, *Fig.* 7. The cross-feed is now moved to various positions and readings taken.

These detailed descriptions of optical checking procedure make them appear more time-consuming than is actually the case. In reality, the entire process described can readily be completed, with a complete set of readings secured, in about an hour by technically qualified personnel.

Fig. 7. Arrangement for making cross-feed alignment check with alignment telescope, target and spindle mirror.



Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Universal Self-Centering Drill Jig

This jig was designed for accurately drilling holes through round shafting. It is universal in that it is capable of being used on work of different diameters and for various sizes of holes.

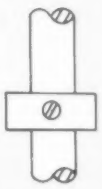
Setup of the work in the jig is simple. Stock is laid on the pad on the base of the jig and the V-block on the adjustable top plate is "scissored" down into position against the work. Longitudinal position can be obtained by a simple adjustable stop on the side of the jig.

Construction of the jig is simple. The body proper is made of steel weldments. Care must be taken in the machining of the holes in the link bars which connect the base with the top plate. It is recommended that these all be drilled and reamed together to assure equal center to center spacing. For maximum wearability these holes in the links should be provided with small hardened and ground standard liner bushings. It would also be desirable to harden and grind the pins upon which these link bars operate. The threaded connector, which is actuated by a hand knob or hand nut, is secured in a slot milled vertically in the upright at the end of the jig. This allows free vertical positioning of the connector when the cover plate is raised or lowered for different work diameters.

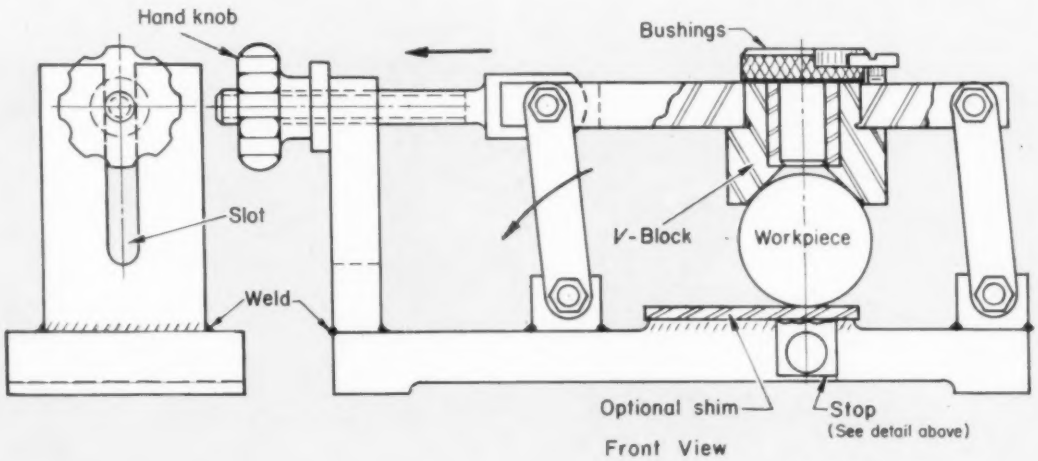
A hardened liner is pressed into the top plate to provide for slip bushings in a range of hole sizes. If desired, a separate loose pad or shim can be laid on the seating pad on the jig base to provide a surface to drill into to prevent damage to the pad.

This jig has proved particularly useful for a great variety of short-run work and one-of-a-kind jobs, when used with a good selection of bushings.

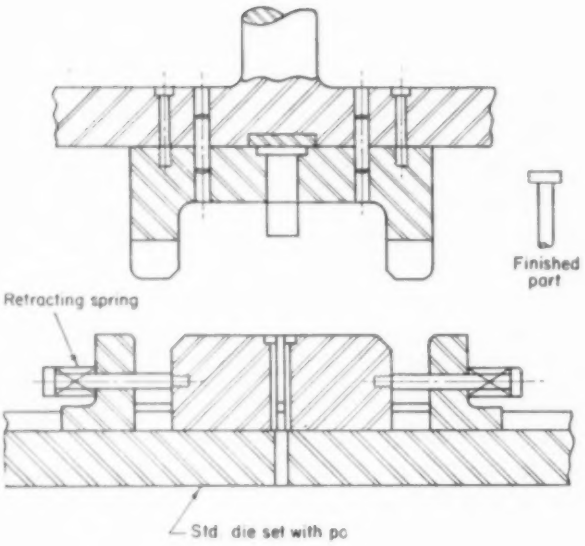
H. J. Gerber
Member-at-Large
Stillwater, Okla.



Detail of Length Stop



Front View



Cam Action Heading Die

Designing a simple, yet effective, die for heading 0.250-inch diameter rod created an interesting problem. After several ideas were discarded the cam die shown in the accompanying drawing was built and proved highly successful.

Stops were provided under the die so that a given length of rod, containing the proper volume of heading stock, would remain above the die. This insured a full head with minimum flash. The cam action afforded easy loading and unloading of the parts without necessity of including any special knockout arrangement.

In operation the rod stock is heated on one end and dropped into the die. As the press descends the cams close the die around the rod just before the head is forged. The lower limit of the press is set to fill the cavity, leaving little flash on top. The die produces an excellent part at minimum cost.

Dale Orr
Knoxville-Oakridge Chapter

Direct Adjusting Boring Toolholder

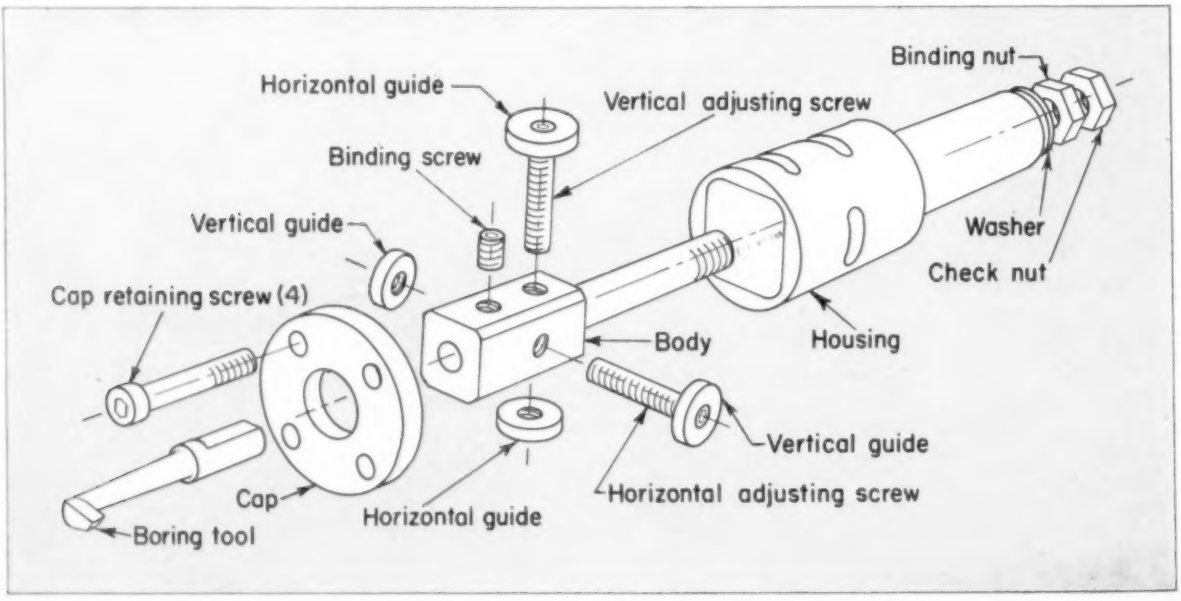
This boring toolholder has two desirable features not usually found in a single unit. By eliminating the eccentric bushing common to many holder designs, it is possible to maintain the original rake and clearance angles while adjusting the tool vertically to the proper cutting plane and while adjusting the tool horizontally to the desired cutting size.

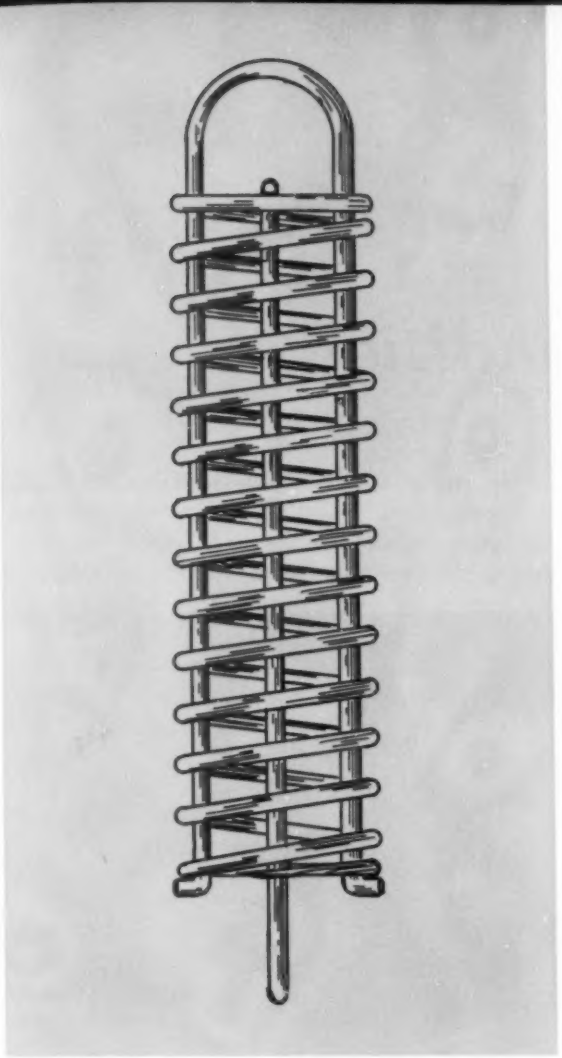
The exploded illustration shows details of construction. The vertical and horizontal adjusting screws consist of standard socket setscrews onto which guide collars are threaded and brazed or silver soldered. The collars are then ground on the end faces to produce a free sliding fit in the square opening of the housing.

In the four corners at the bottom of this housing are tapped holes to receive cap retaining screws. These serve to confine the body assembly within the housing.

When the cutting tool has been properly adjusted by means of the adjusting screws, which are accessible through slots in the housing, the binding and check nuts are tightened and the tool is ready for operation.

Allen Johnson
Springfield, Mass., Chapter





Special Tension Spring for Jigs and Fixtures

Many sizes and styles of springs are required for the various jigs, fixtures and special machines used in most metalworking plants. Compression springs are readily available from commercial suppliers in a wide variety of sizes and can easily be cut to the desired length. Tension springs are less widely used but often a particular size is vitally needed. Although available, sometimes the size desired cannot be located quickly. It is a simple matter to wind small springs from light wire. When heavier springs are required the job is more difficult and time consuming.

The problem can be overcome simply by altering compression springs to suit the application. By bending over two loops of rod and slipping them through the spring, as shown in the sketch, a strong eye is secured on each end. Ordinarily when a regular tension spring breaks the machine involved is out of service. Occasionally accidents result from such a spring failure.

The arrangement described has an advantage over conventional tension springs. If the spring breaks it will collapse only to its solid height. This may not result in a work stoppage as it may be possible to continue the operation until a replacement can be obtained.

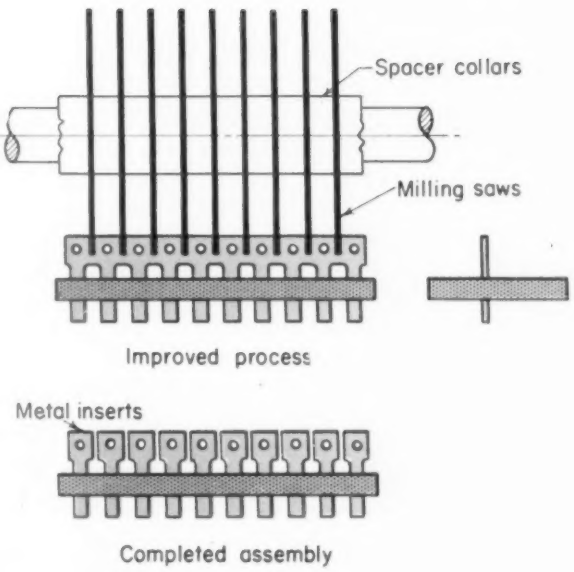
H. S. Koslow
Bronx, N. Y.

Improved Processing Method

Conventionally the assembly shown in the accompanying illustration would be produced by loading the 10 metal inserts in a molding die. Then the plastic would be injected into the die to form the base. Loading inserts individually entails excessive handling, increasing cost of the assembly.

To reduce loading time the inserts are blanked as a single piece as shown in the sketch. This unit is readily loaded in the molding die. After the plastic base is formed the assembly is taken from the die and set up in a fixture for milling. The unwanted metal is quickly removed by gang cutters consisting of a series of mill saws properly spaced by collars. A substantial saving is effected.

Cliff Bossmann
Dayton Chapter



Meeting Milling Requirements
under shop conditions

By A. O. Schmidt*

Research Engineer
Kearney & Trecker Corp.
Milwaukee, Wis.

Fig. 1. Special carbide milling setup on horizontal milling machine. Use of vertical head and rotary table detracts from rigidity.

TO STAY COMPETITIVE, every metalworking shop must be critical of existing machine tools, tool design methods, tool grinding procedures, grades of tool materials, feeds, speeds, processes, and the design and material of the workpiece itself. An engineering approach to production problems is mandatory but must be based upon a thorough understanding of numerous machine tool factors which only actual practice can provide.

More causes for vibrations occur in milling machines than in any other machine tool. Even the more uniform cutting action of a lathe tool entails fluctuations in the cutting force as well as in the instantaneous cutting speed during the formation of a single, short chip.[1, 2] This condition is accentuated in milling *Fig.* 1, with interrupted chip formation caused by successive engagements of cutter teeth, which form chips of varying cross sections.[3] Moreover, the angular velocity of the milling spindle is subjected to cyclic deviations due to repeated entrance and exit of cutter teeth with respect to the work. This causes torsional vibrations which often increase with cutting speed.[4] Consequently, milling machines and milling cutters must be designed to give consideration to these factors in order to obtain rigidity and inherent damping properties. General purpose milling machines must be constructed with capacities more or less independent of spindle speed (rpm). This means that the designer will attempt to make the full power available at the cutter, whether the machine operates at the lowest or highest spindle speed.

Objectionable and detrimental vibrations in a milling machine on the production floor may be attributed to numerous causes. Considering the shop practice of overloading milling machines, often by as much as 100 percent, especially when machining steel or cast-iron workpieces, gives an appreciation of the stamina of milling machines. Often operators and supervisors are unaware of the condition. A machine will produce fewer pieces per cutter grind under such severe overloads but can still leave an acceptable finish and accuracy

*Senior member ASTE Milwaukee chapter.

[1]References are tabulated at end of article.

Based on a paper presented at the M.I.T. Machine Tool Conference, 1954.

on the workpiece. During an extensive series of test cuts on a 50-hp Kearney & Trecker milling machine at the Naval Shipyards in San Francisco a steel block was machined with a cut 8 in. wide and 0.225 in. deep, at a feed of 53 ipm, performance being satisfactory.[5] In this instance the carbide cutter removed more than 95 cubic inches of steel per minute.

A well-designed and well-built milling machine has all rotating parts dynamically balanced. Tolerances are very close in manufactured parts and all pieces are dimensioned so that no distortion which can cause unbalance will occur at high speeds or heavy loads. Any milling machine may run smoothly under uniform load, namely, cutting with a slab mill having a large helix angle, or when the spindle is loaded through a Prony brake. A milling machine spindle will also operate with less fluctuation in speed with cutters having close tooth spacing, such as old style HSS cutters or carbide cutters for cast iron.

Causes of Poor Performance

The situation may change, however, as soon as a heavy, interrupted face-milling cut on alloy steels is taken. This, of course, is a good performance test. When wide surfaces of steel and aluminum are to be machined, the teeth of the cutter must be more widely spaced to provide sufficient chip room. Even this should result in a quiet run, at least one without objectionable vibration or gear noise.

Cutter, workpiece and machine must absorb the cutting forces without detriment to performance or to the accuracy of the finished surface. These requirements in a milling machine are very exacting because the resultant cutting force on each tooth varies constantly in magnitude, point of attack, position and direction.[6]

Variations can be caused by:

1. Directional feed changes of the workpiece relative to the cutter
2. Nonuniformity of speed in feeding and in cutting due to excessive overload
3. Varying rake angles of the cutter
4. Fluctuation in the number of teeth that are cutting simultaneously.
5. Differences in the geometrical size of chip
6. Cutter running out of true
7. Chipping and unevenness of individual teeth in the cutter
8. Changes in width of workpiece and depth of cut
9. Nonuniformity in microstructure of workpiece material
10. Time deviations of cutter engagement with work, due to nonuniform cutting speed
11. Effects of torsional and axial deflections of gear shafts
12. Errors in cutter grinding and normal wear of tools.

To avoid objectionable deflection under heavy loads[7], stiffness and resistance to vibration must be incorporated in the main part of the milling machine without excessive increase in weight. This is accomplished by providing strong sections only where needed and avoiding openings which may weaken the structure. Even then the column of the knee type milling machine can vibrate horizontally or vertically, excited by unbalanced centrifugal forces. These originate in the milling cut, usually when the product of the spindle speed in revolutions per minute and the number of teeth

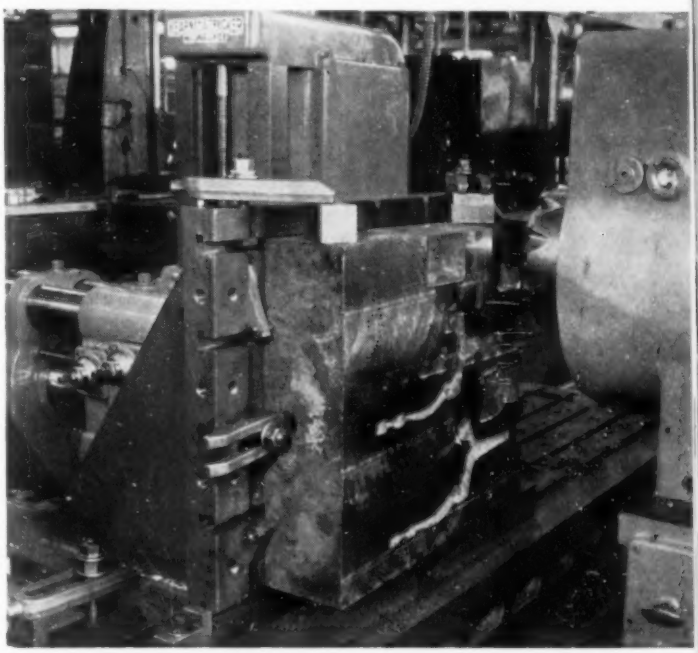


Fig. 2. During resurfacing, the forging die-block is clamped against a heavy angle plate. The bed type milling machine used in this operation has a 50-hp ram type head with a flywheel in the housing close to the spindle nose.

coincide with the natural frequency of the column in a horizontal or vertical direction. However, other structural members of the milling machine, such as the overarm assembly, table and knee, have characteristic natural frequencies which can cause troublesome periodic impulses when resonance with the cutting force frequency occurs. Also, the workpieces or their holding devices may be a source of undesirable vibrations during a milling operation. If such conditions occur at low frequencies, in combination with a poor foundation, the machine can actually begin to "walk" or, if the mounting on the floor is rigid, shake itself to pieces.

The natural frequency of a vibrating part can be altered by weight changes or the vibratory energy can be dissipated by friction. Sometimes it will be necessary to employ a special vibration dampener which creates a counter action to the exciting os-

cillation. The foundation of the milling machine is vitally important and must be of such a nature that disturbances from the outside, passing vehicles, cranes, or presses, are not transmitted to the machine. Mounting a milling machine on elastic pads of adequate stiffness may eliminate the transmission of adverse agitation without changing the natural frequencies of the machine.

Cutters must be balanced and assembled with close tolerances to eliminate vibrations as much as possible. Cutters mounted on long and light arbors may cause large, severe vibrations and whipping of the arbor if the operating speed is at or near a critical value. This often can be avoided by using arbor supports or a stronger arbor in good arbor bearings and mounting the cutter as close to the spindle nose as practical.

Cutter bodies which deflect or are not solidly mounted on the arbor due to a large hole or loose-fitting key may produce a poor surface finish and exhibit a chatter pattern, similar to that of single point tools.[8] The same is also true when individual teeth have excessive overhang or are not solidly supported by the cutter body. There are many other factors. For instance, chatter patterns may also become evident when the workpiece is not stiff or rigidly supported.[9]

For many of these causes a flywheel is incorporated in a milling machine in order to obtain a more uniform cutting speed. When a flywheel is of proper size and is mounted on the spindle of the milling machine, performance generally will be improved. A flywheel mounted on the arbor, some distance from the spindle nose, has often been found to be more injurious than helpful, however, since the weight will cause additional deflection of the arbor even if the machine runs with apparent improvement, that is less noise.

Flywheels are usually made as disk type wheels of cast iron or low carbon steel. If of sufficient size, they serve as a reservoir of restorable kinetic energy. Since milling machines are usually operated with an overload of between 25 and 50 percent, the flywheel will help to meet peak power demands of short duration when the teeth are taking the heaviest cut. At the same time the inevitable vibrations of heavy milling cuts will be kept within permissible limits.

A knee type milling machine is generally preferred for ordinary production and toolroom work because of its versatility. For a heavy milling job such as die-block milling, a bed type milling machine usually is better because of its greater stiffness. The milling operation shown in *Fig.* 2, namely, resurfacing a used forging die-block, is most severe. A certain amount of vibration is unavoidable because the hardness of the material varies, being between 325 and 450 Bhn. Also, cavities in the surface will be detrimental to performance and tool life. This operation was made economical by mounting the block as rigidly as possible on the table close to the spindle nose and correlating cutting speed, feed, depth and width of cut with power available.

The performance of an older, light knee type milling machine was improved by mounting a fly-

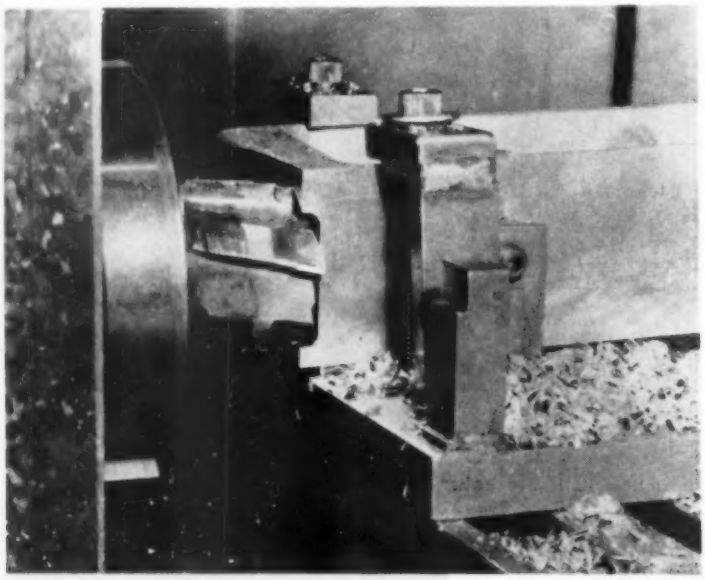


Fig. 3. (above) Older style horizontal milling machine with auxiliary flywheel mounted on rear of spindle nose.

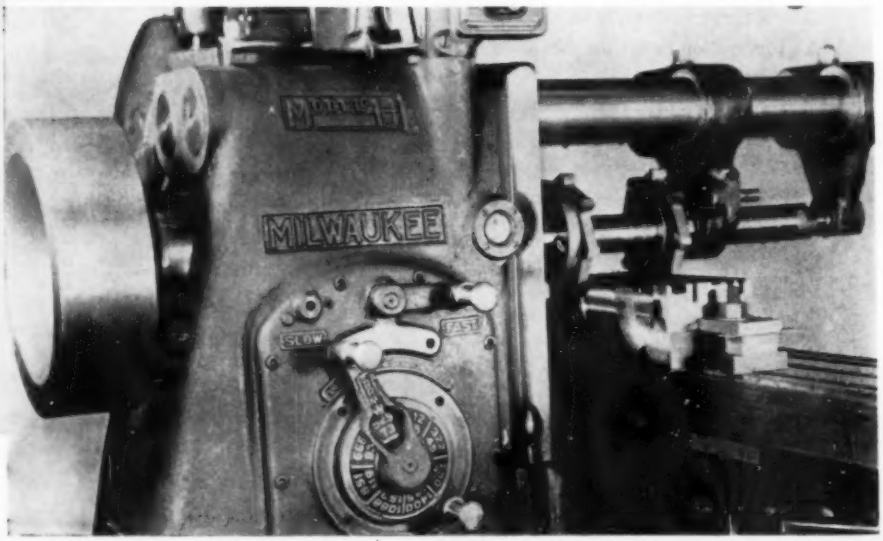


Fig. 4. (right) Older style horizontal milling machine with auxiliary flywheel mounted on rear of spindle.

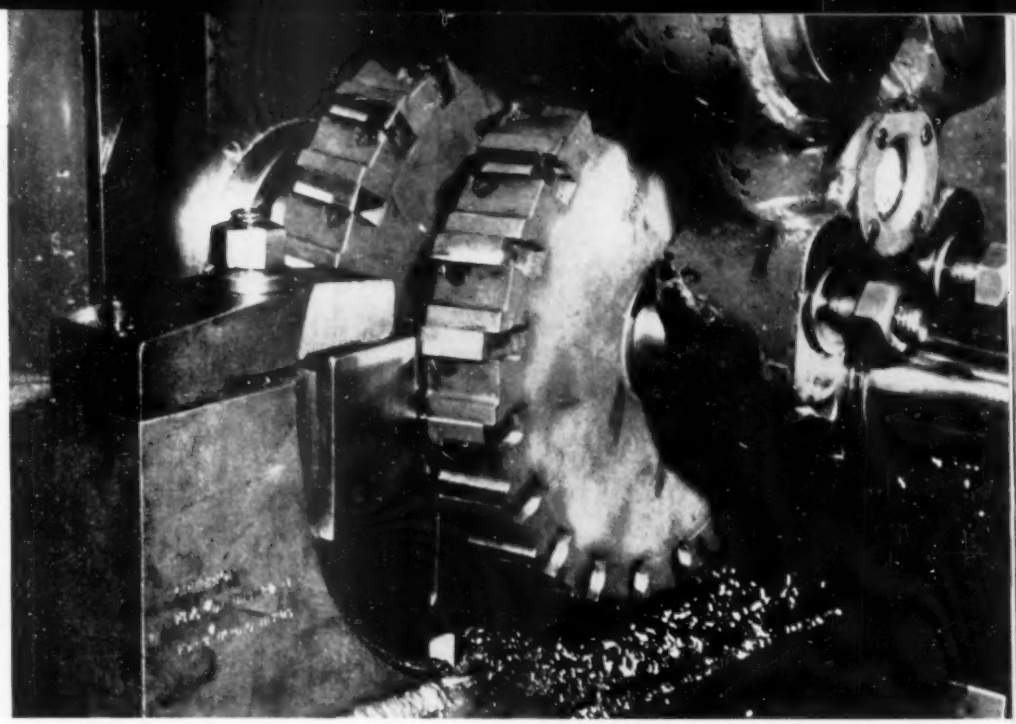


Fig. 5. Rigid setup conditions. Two carbide milling cutters, arbor-mounted close to the spindle nose with a closely placed pendant support, improve performance of an older machine.

wheel of appropriate size on the spindle nose, *Fig.* 3. In another case the flywheel was mounted on the rear end of the spindle, *Fig.* 4. It should be noted, however, that a newer machine having a flywheel incorporated in its design also has adequate electrical equipment for starting and stopping the spindle, and parts strong enough to withstand the increased inertia loading associated with accelerating and decelerating the flywheel.

Large, heavy cutters may give sufficient flywheel action as in the setup shown in *Fig.* 5. When these cutters are mounted close to the spindle nose on a heavy arbor supported by an overarm pendant or bracket, good performance and tool life will result.

A milling setup that cannot be very stiff because of the number of additional elements involved, such as a rotary table and heavy-duty vertical milling attachment, is illustrated in *Fig.* 1. A carbide cutter with positive rake angles, exerting smaller cutting forces, permitted good production under these conditions.

Appropriate tooling with the various tool materials available today can often be employed to improve a severe or troublesome milling operation. For example, the straight-toothed carbide cutter shown in *Fig.* 6, when used alone to mill a channel 2½ in. wide and 1½ in. deep at a feed of 8 ipm in 250 Bhn SAE 1050, operated with objectionable vibration and gear noise.

The setup was analyzed. With the addition of spiral slab mills of smaller diameter on each side, cutting at a depth of only 0.100 in., the operation smoothed out with vibration and gear noise considerably reduced. Smooth, progressive entrance of the spiral teeth into the workpiece dampened the impact action of the straight teeth. The difference in diameters of the carbide cutter and the slab mills, which had cast alloy teeth, was such that both tools, though rotating at the same speed, were cutting at recommended speeds.

When requirements of accuracy, surface finish and tool life are not met, even though speeds and feeds had been chosen for optimum conditions, the following points relating to the job setup, the cutter and milling machine should be checked:

1. Machine capacity for the job — the horsepower should be within permissible overload limits
2. Milling cutter—tooth strength and spacing should be adequate for the chips. Current runout should be kept within 0.001 to 0.002 in. when mounted on milling machine. Relief and clearance angles must be large enough to avoid interference
3. Mounting—if the cutter is mounted on an arbor, both should be as strong as possible, the cutter being positioned close to the spindle nose. When several cutters are mounted on the same arbor, properly fitted arbor supports should always be placed close to the cutters. A high-speed arbor support with needle bearings should not be used at low cutting speeds for heavy cuts
4. Backlash—Table screw backlash should be at a minimum. There should be no looseness of gibs between slides such as the table-saddle, saddle, knee or knee-column
5. V-belt drives—These should be sufficiently tight and run uniformly
6. Holding device and workpiece—These should be as close to the table surface as possible in order to gain maximum rigidity and the workpiece should be securely held.

It should be kept in mind that in a heavy milling operation the teeth strike individual blows on the workpiece surface. The force of these blows is similar to that of a sledge hammer hitting the workpiece, the impact being transmitted throughout

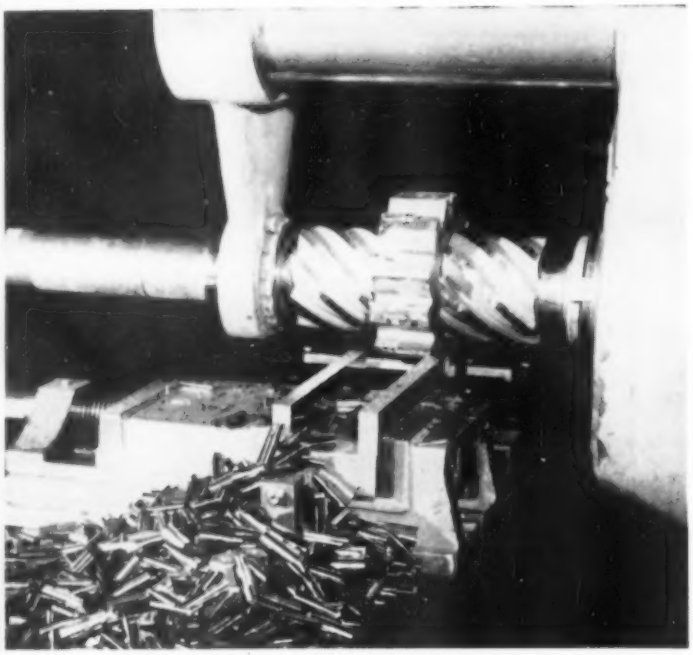


Fig. 6. Heavy milling operation on bed type machine.

the machine. With this in mind, tool and production engineers should select proper cutters, fixtures, speeds and feeds. That this is usually done is brought out by industrial production records and again in reports of metal-cutting research.[10] The basic factors discussed should serve as a guide in the consideration of means to eliminate or alleviate difficulties as they arise.

References

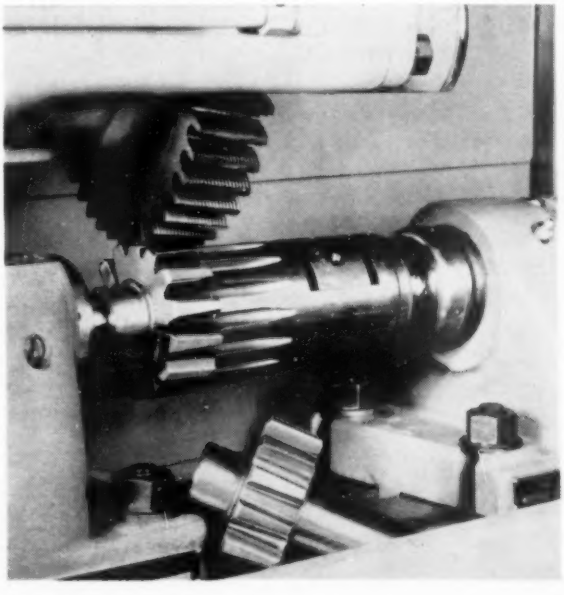
1. "Discontinuous Chip Formation," by N. H. Cook, Iain Finnie and M. C. Shaw, Trans. A.S.M.E., February 1954, pp. 153-162.
2. "Reduce Machine Vibration," M. Kronenberg, *American Machinist*, September 29, 1952, p. 101.
3. "Cutting Forces and Temperatures When Milling with Carbide Cutters," by H. Opitz and J. Kob, THE TOOL ENGINEER, Vol. XXX, No. 1, January 1953, pp. 35-41.
4. "Dynamic Investigation of the Milling Process," by F. Eisele, *Berichte ueber betriebswissenschaftliche Arbeiten*, Vol. 7, VDI Berlin, 1931.
5. "Milling Machine Power Requirements," by A. O. Schmidt, *Western Machinery and Steel World*, Vol. 41, No. 6, June 1950, pp. 65-67.
6. "Experimental Measurement of Cutting Forces and Speeds," by J. B. Armitage and A. O. Schmidt, THE TOOL ENGINEER, Vol. XXVII, No. 4, October 1951, pp. 36-40; No. 5, November 1951, pp. 50-54. *Werkstattstechnik und Maschinenbau*, Vol. 42, No. 1, January 1952, pp. 1-7.
7. "Vibrations in Knee Type Horizontal Milling Machines," by Ivar Bendixen, Trans. A.S.M.E., 1953, Vol. 75, pp. 567-574.
8. *The Action of Cutting Tools*, by A. J. Chisholm, J. M. Lickley, J. P. Brown, London 1951, The Machinery Publishing Co.
9. "On the Chatter Vibrations of Lathe Tools," by Shizno Doi, Memoirs of the Faculty of Engineering, Nagoya University, Vol. 5, No. 2, September 1953.
10. "Cutter Life for Face Milling Cast Iron," by W. W. Gilbert, O. W. Boston and H. J. Siekmann, Trans. A.S.M.E., Vol. 6, No. 4, May 1954, pp. 607-612.

Gear Production Increased by Cutter Development

TEETH ON STEERING gear segments in automotive steering mechanisms are being shaved by an unusual process which utilizes a special conical helical shaving cutter developed by National Broach & Machine Co. The process, which performs shaving operations in about half the time required by conventional methods, produces a gear that meets rigid specifications for finish, size and tooth taper.

To shave a gear segment by the process, the segment is mounted in an arbor assembly having steel dummy teeth which complete the tooth circumference. The gear segment is located in correct axial location in the work arbor and dummy gear assembly by clamping the gear against the face from which it was generated in the previous gear tooth roughing operation. Gear and arbor unit are then mounted between centers in mesh with the cutter on a standard rotary gear shaving machine set up to shave the gear by the diagonal method.

The work gear assembly is fed across the cutter on a diagonal path at 90 deg to center line of the cutter. The work gear feeds back across the cutter and the gear and arbor unit is removed with completion of the shaving cycle.



Closeup shows mounting of the steering gear segment in the arbor and the dummy gear assembly. A steering gear segment is shown at the front as finish shaved.

how to fabricate plastic-faced dies

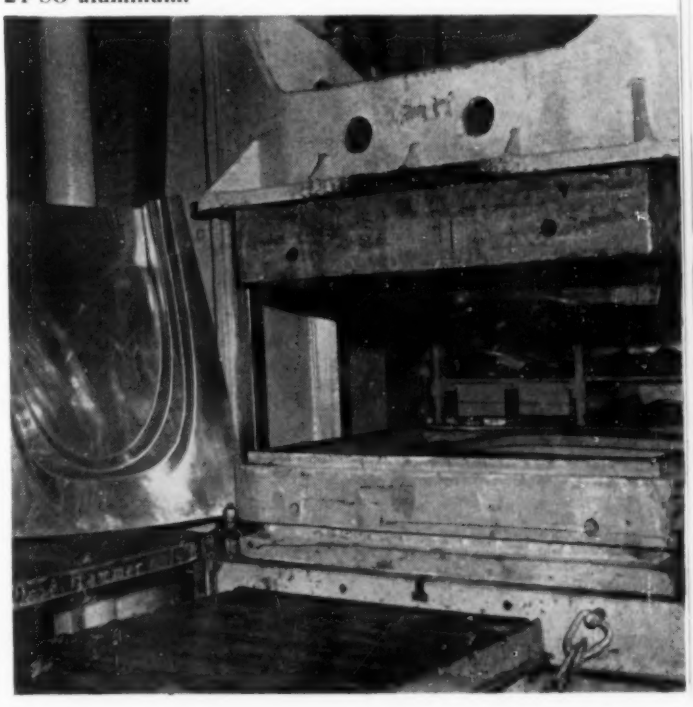
By Walter A. Hockett

Douglas Aircraft Co., Inc.
El Segundo, Calif.

PLASTIC-FACED DIES can be produced in less time and with lower material costs than standard metal dies. Such faces increase die life as much as ten times and faithfully form fine detail in workpieces. Epoxy plastics, as used in drop hammer, *Fig.* 1, and draw dies, fall into two categories: rigid aluminum-filled materials for Kirksite dies and resilient unfilled plastics for lead punches. Both types are based on amine synthetic liquid resin.

Brittleness of the aluminum-filled rigid type is controlled by limiting the plastic layer to a maximum thickness of ¼ inch. When limited in thickness, the plastic surface has hardness values as good as, or generally better than, Kirksite metal. Aluminum color of the coating psychologically creates acceptance of the coating by hammermen who, in some instances, have been reluctant to trust nonmetallic coatings. They learned their art with metal-to-metal operation and red or yellow materials create psychological barriers.

Fig. 1. Drop hammer die using aluminum-filled epoxy on female half and clear resilient epoxy on the male half. Pictured part was formed of 0.064-inch 24 SO aluminum.

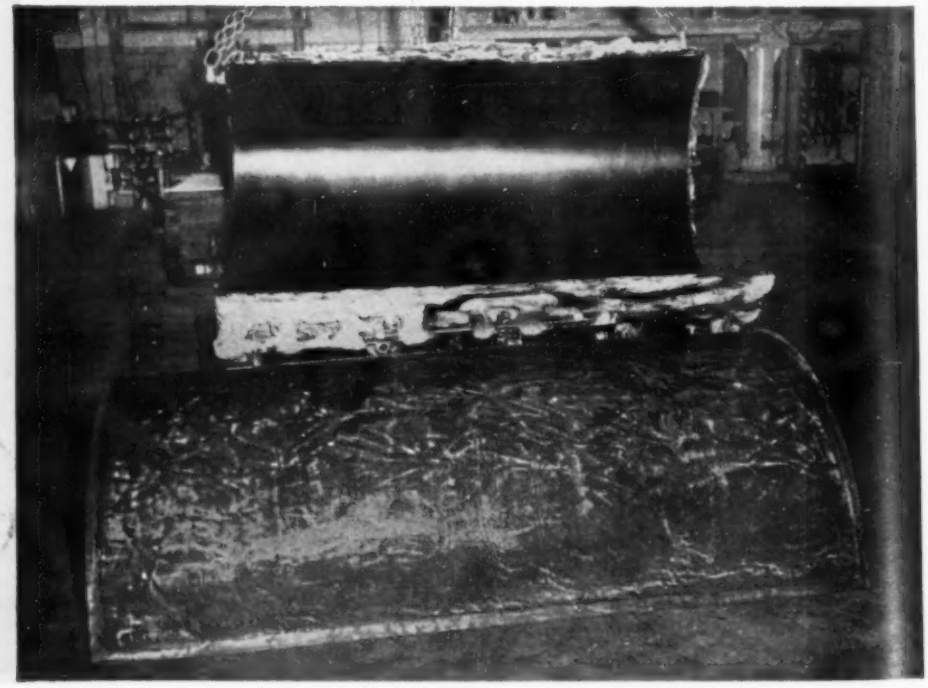


Resilient coatings of the lead punches have advantages over straight lead contact punches. The coated punches are more durable because of the physical properties of the plastic. Lead will start to compress with the first hit and will never regain its original contour. The resilient plastic, however, will compress at each hit but regains its basic shape before another hit can be made.

As part of a development program, steel balls were placed on an aluminum-filled plastic-coated Kirksite die. The plastic-coated lead punch was permitted to drop on the balls. Imprint of the balls could clearly be seen on the resilient plastic covering of the punch as it was raised from the bed. Before another hit could be made, the indentations had disappeared. The coated Kirksite die was unmarked by the test.

Fig. 2. (above) Plaster cast taken from master plaster pattern. Cast has been prepared with necessary parting agents and is ready for positioning with Kirksite core.

Fig. 3. (right) Kirksite core covered with brush coat of clear epoxy plastic. Proper face configuration will be formed by plaster cast in background.



Plastic-coated dies can be quickly repaired at small cost. If, for instance, a bead should break, a partial cast is fastened to the broken section of the die and the proper plastic coating is applied. After curing, the surface is superficially polished and the die is again ready for use. Welding of metal to the die and hand polishing to template contours are unnecessary.

When a die becomes obsolete, it is a simple operation to salvage the lead or Kirksite by heating the die to approximately 250 F. At this temperature, the plastic and metal can be separated easily. The metal can be remelted without danger of contamination or toxic effects to personnel in the melting area.

Fabrication of plastic-coated dies is relatively easy and hundreds of hours can be saved over conventional metal die fabrication techniques. Tooling costs for average and large-size dies have been lowered as much as 40 percent when compared with conventional methods of manufacture that include grinding to a blue block for exacting dimensions and configuration. Depending on the development time necessary, it is possible to complete a plastic-surfaced die in from one to seven days, elapsed time.

Normal fabrication of a drop hammer die begins when a plaster cast, *Fig.* 2, is lifted from the master plaster pattern. The cast is reinforced with black iron pipe. The cast surface is then built up ¼ inch with pattern-makers' wax or water clay.

From this cast, a plaster pattern is made that is a rough approximation of the contours of the desired die. Next, a sand mold is made from this pattern. Before the mold is poured, a piece of 1-inch aluminum tubing, to be used later as a pouring gate, and

several pieces of ¼-inch aluminum tubing, to act as vents, are inserted in the face of the sand mold. Without these tubes, it would be necessary to drill through the Kirksite core because all plastic faces of dies are poured through the metal to the coating area while the die is in a horizontal position.

After the Kirksite core has been removed from the sand mold, oxidation is removed from the face of the die with a coarse grit sanding disk. Because none of the Kirksite contours are critical, this is a fast operation. A brush coat of clear epoxy is immediately applied to the Kirksite die face, *Fig.* 3. This coating acts as a primer to promote adhesion of the metal-filled plastic to the Kirksite. Clear epoxy is used because it adheres better than the filled type.

In the meantime, the wax or clay is removed from the original plaster cast and its face is sprayed with from three to five coats of lacquer. Colored lacquer is used because uniform coverage of the surfaces is more easily checked. Two or three coats of high-quality carnauba wax are applied over the lacquered surface to act as a parting agent for the plastic coating.

The Kirksite core is then rigged ¼ inch above the plaster cast to form a cavity and the edges are sealed. Aluminum-filled plastic is poured through the aluminum tubing gate, *Fig.* 4, into the face cavity. The plastic sets in 12 to 45 minutes, depending on the fill, so no time can be lost during the pouring operation.

After 24 hours, the die is removed from the rigged position with the plastic coating securely adhered to it. The plastic surface is cleaned in preparation for fabricating the punch. Removal of flash that may have leaked through the seal is the only cleaning required because the plastic surface is a perfect duplication, in reverse, of the contours of the cast.

Punch Is Prepared from Die

Punch fabrication is begun by claying up the new plastic-coated Kirksite die to a depth of ¼ inch and making a plaster pattern directly from it. Aluminum tubing vents and a gate are assembled in the plaster pattern after which the lead punch core is poured. The punch is rigged over the plastic-coated die after the die has been prepared.

This preparation entails removal of the clay and then coating the filled-plastic surface with two coats of carnauba wax to act as a parting agent. Care must be exercised during the waxing operation because any surface not protected by wax will adhere to the punch when the resilient plastic cures. After curing, the punch is cleaned, voids are filled with a hypodermic needle and the hammer dies are ready for use.

Stretch-form dies of plaster and concrete have long had the reputation for rapid deterioration due to weathering and the action of lubricants used to reduce friction during stretching. Frequent reworks are necessary with this type of construction and fabrication time is long because of the extended setup time required by concrete.

Fig. 4. Die being poured with aluminum-filled epoxy. Acetate funnel is used to build up a head to help force plastic into cavity.

Epoxy plastics, *Fig.* 5, avoid many of the faults of plaster-concrete dies. A thin skin laminate, consisting of 3 or 4 layers of 0.020-inch fiberglass cloth is lifted from the master plaster pattern and distorted to a convenient radius. This laminate, held in position with plywood, serves as a mold.

Surface of the mold is prepared with several coats of colored lacquer and at least two coats of carnauba wax. A heavily filled troweling material is applied

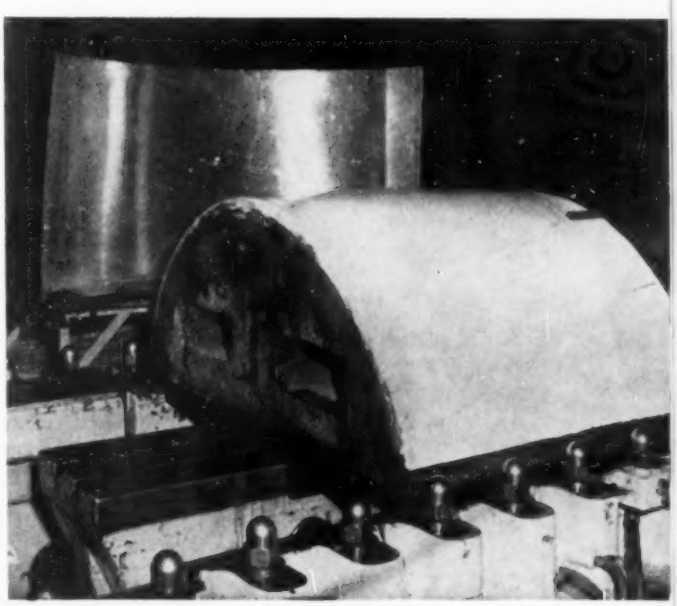


Fig. 5. Stretch form die fabricated with epoxy plastics. Die facing is a heavily filled material approximately ¼ inch thick.

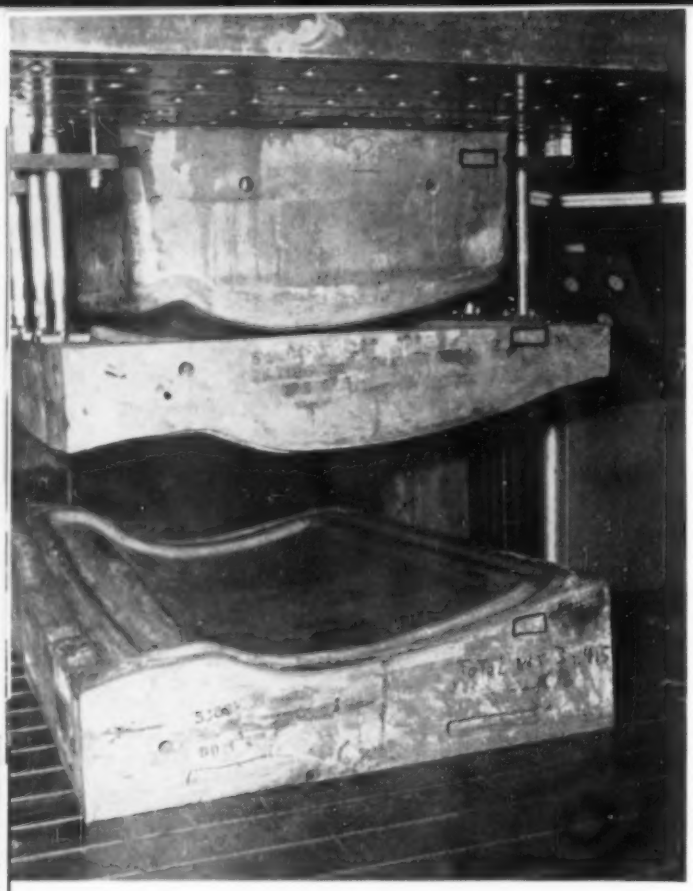


Fig. 6. Draw punch and die faced with aluminum-filled epoxy plastic. Draw ring is cast of Kirksite although resilient plastic could be used instead.

to the surface of the mold to a thickness of ¼ inch.

While the troweling material is being prepared, a cement mixer is filled with core material consisting of 75 parts of pea gravel, 15 parts of sand and 10 parts of epoxy resin. The quanity of sand required varies with the size of the gravel. Sand is needed to fill all voids between the gravel particles so the core will be dense. Complete wetting of the aggregate must be accomplished by thorough mixing before the mixture can be poured into the mold. The mixture must be poured before the troweling material is completely cured. When the exothermic heat, generated by the setting resin, has dissipated from the die, it can be removed from the mold.

Many hours can also be saved in building draw dies if plastics are incorporated in the design. Such dies can be built by the same methods and techniques used with drop hammer tooling. Additional savings in draw die fabrication are realized when plastic materials are used because there is no need for spotting-in on the draw press. Rigid, aluminum-filled plastics work satisfactorily, and combinations of rigid and resilient plastics can be used.

The costly draw bead, which requires precise fitting, may be avoided by using resilient material in its place, *Fig.* 6. Production parts made on dies with a resilent draw bead are as good as, or better than, those made on conventional dies.

When it is necessary to draw over small radii, it is advantageous to use resilent plastic on the punch. The plastic will compress and span the radii resulting in less strain on the metal part. This eliminates the need for preform operations and additional heat treatment. When the punch has bottomed, it will expand and pick up each minute detail in the die. The resilient plastic returns to its original form on the up stroke.

Because plastic-faced dies can be fabricated without difficulty and since they produce good piece parts, time expended in developing fabricating techniques is well spent. Equipment needed during fabrication is not expensive, especially when figured in terms of the results that can be obtained.

Metal Cutting by Chemicals

GREAT POTENTIAL ENERGY inherent in elemental flourine and in the halogen fluorides has been channeled for its first important industrial use. By encasing the chemical in a heavy-walled cylinder equipped with a pressurizing chamber and a firing head having appropriately spaced orifices, its power can be controlled for cutting and perforating steel pipe in oil-well operations. This accomplishment was the result of the combined efforts of McCullough Tool Co. and Pennsylvania Salt Mfg. Co.

In use, the assembly is lowered into an oil well and accurately positioned. Electrical impulse through an electronic panel and conductor cable causes the chemical to be ejected under tremendous pressure against the inner pipe wall. Penetration is accomplished in a fraction of a second. By changing the placing of the openings, the tool makes a clean cut. There is no flaring of the cut pipe as is attendant with commonly used explosive methods. Perforations are smooth and burrless.

This achievement involved correlation of problems in well drilling and those created by the active characteristics of the chemical. Halogen fluoride causes ignition of any organic material it contacts, reacts explosively with silicon compounds and sets fire to asbestos.

A chemical-cutter for oil-well casing has been developed and will be available for commercial use shortly, while additional research is centered on development of other tools to do the work which diamond bits are now accomplishing somewhat slowly and expensively.

Honing Techniques

control size

By Glen M. Calvert
President
Jes-Cal Co.
East Detroit, Mich.

SELECTIVE FITTING OF PISTONS in engine cylinder bores may soon be unnecessary because of recent developments in honing and honing equipment. Related advances, which are nearing fruition, include the cam-turning of eccentric shaped pistons and may eliminate need for selection. Honing tools are being used to size and finish cylinder bores uniformly within 0.0005 inch for size and with the desired 0.0005-inch total taper.

Connecting rod crank end bores for an automotive engine are being honed with the tooling shown in *Fig.* 1. These bores are being held within 0.0003 inch for size and within 0.0002 inch for bore accuracy without any measurable bellmouth or taper. In several honing installations, the rates of savings over formerly used equipment have been sufficient to amortize the original tooling cost within six months. These results have been credited to: avoidance of scrap bores due to oversize or swipes; no reruns due to undersize bores; infrequent replacement of tool guides and size gages; up to double the number of bores honed per set of stones; and substantially less lost operating time formerly required for replacement of stones, guides, size gages and electronic control tubes.

Design and operation of hones that will size have been simplified yet they may be easily adapted to use with all makes of honing machines. They may be installed with only guide bushings and simple limit switches to control the operation of each tool, *Fig.* 2. They do not require actuating bushings. Electronic controls and systems may be bypassed or removed entirely. However, such tools may be included in the combined, automatic controls provided for transfer type machine installations. Such flexibility minimizes capital investment, production interruptions and operating costs.

This approach to better control for honing operations requires a brief mention of a major principle that has influenced developments. Honing tool design and operation have been required to compensate for many factors inherent in the mechan-

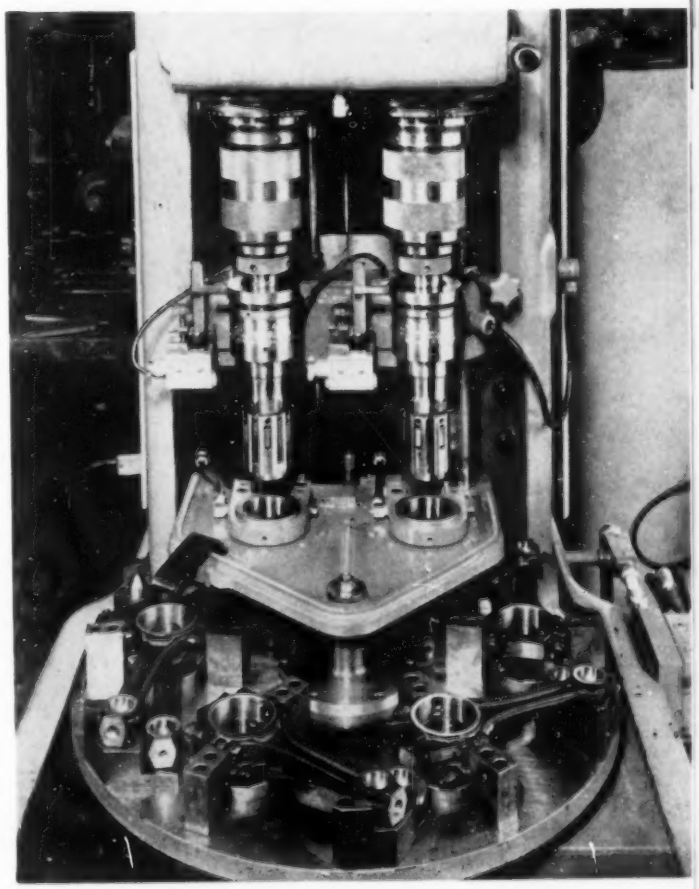


Fig. 1. Twin-spindle installation of honing tools for finishing bores of two stacked connecting rods to uniform size.

*Senior member ASTE Detroit Chapter.

ical equipment available. With portable drills, and later during the long development of mechanical and hydraulic reciprocation of honing machine tables and spindles, it was necessary to compensate for misalignment between the axis of the bore and that of the spindle.

So-called universal joints were adopted so that the tool head could operate off-center from the spindle. As a result, the honing head could tilt and follow the wandering axis of a snaky bore. Correction of snakiness was relatively uncertain and uncontrollable. This was particularly true in horizontal boring operations on long-length tubing type bores. Because of this body tilting feature, the honing operation has often been likened to pushing on a string and has lacked acceptance in many departments producing precision components.

Fig. 2. Honing tool used to finish automobile engine cylinder bores. When the size gage, next major projection above the honing head, enters the bore, a limit switch is tripped and honing stops.

With modern casting and machining techniques, precision spindle design and construction, accurate fixturing, and automatic work handling and work location, the need for off-center compensation has been so reduced that completely rigid drive shaft construction is now practicable. Such construction is highly desirable because it provides better control and more effective use of cutting pressures and speeds.

Heavy, rigid drive shafts without universal joints make the honing tool an extension of the machine spindle, solidly supported in operation by the spindle and its bearings. Rigidity of machine spindle and honing tool provides more uniform application of machine power and abrading pressure. Rigidity also helps make possible the use of greater ranges of rotation and reciprocation speeds for faster abrasive travel, generation of closer parallelism between bores, minimization of mechanical chatter and elimination of the possibility of swipes as the honing tool leaves the bore.

To avoid selective fitting of parts in a majority of mechanical assemblies, uniform size must be held dependably and automatically within a few ten-thousandths of an inch. Although many ingenious automatic sizing methods and devices have been tried in recent years, many production executives claim that they have found it impossible to control size within limits of less than 0.002 inch.

Gage Is Integral with Tool

A simple, positive and dependable method of automatic sizing of cylinder bores is provided by the size gage shown in *Fig.* 2. This unit is designed so that it is an integral part of the tool while its operation is independent of the expansion of any parts of the tool. It is nonrotating and at no time depends upon tool rotation for its operation. Its carbide tips minimize wear and last for many months in high production. Operation is entirely independent of any adjustment for stoneholder feed-cut or stone wear. Size control does not depend on friction of tool or gage parts, separate plug gage devices, air escapement or resistance. It is entirely mechanical and can be combined only with a rigid drive shaft tool.

The size gage, laterally floating within controlled limits and having a number of carbide tipped contact points, is mounted around the tool drive shaft just above the hone body or honing head of the tool. It is split for quick interchangeability. Provided with a suitable amount of lead, the tips permit the lightly spring-loaded gage to find and center itself while trying to enter the bore. Full entrance of the gage into the bore causes a block on the tool to trip a limit switch, which collapses the stoneholders and stops the honing action.

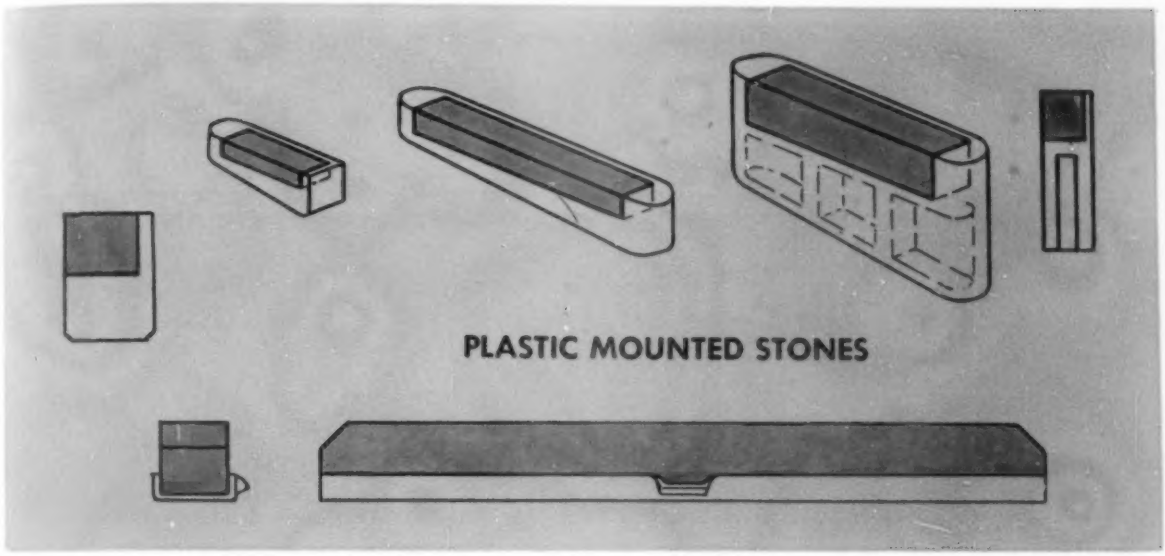
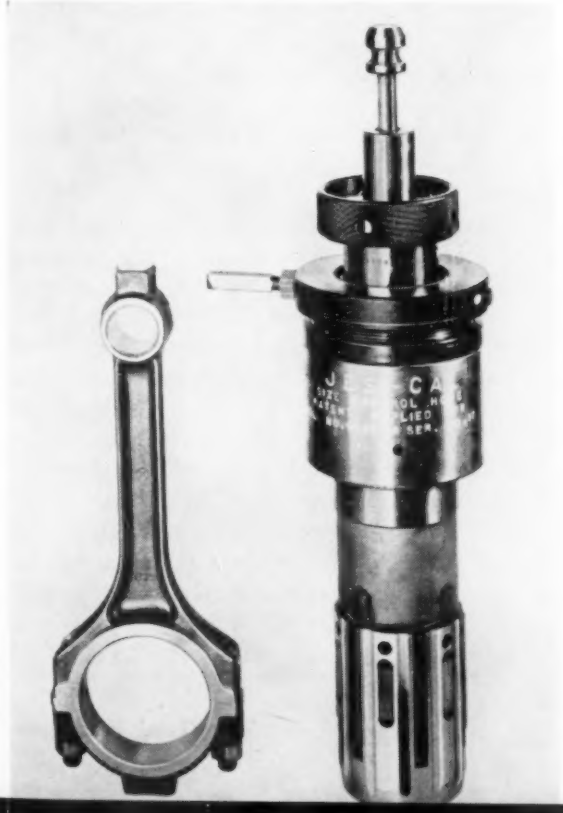


Fig. 3. Plastic-mounted stones, top, have entire leading edges exposed so coolant cannot be wiped off ahead of the cut. Lower stone and metal shell assembly is for larger tools.

This positive gaging action holds bore size accurately and dependably within any desired number of selective 0.0005-inch limits, or the one 0.0005-inch total allowable limit required to eliminate or minimize fitting of pistons in automotive engines. Accomplishment of this objective is anticipated with completion of a machine for cam-turning the outside diameters of pistons to a slightly oval shape within equally close tolerance. Until then, size-control gaging, in a cost-reversal of past production practice, is selectively holding bore sizes to meet any variations in piston production.

Plastic mounted stones, which provide cool, fast cutting action with long life, are used in tools for ½ to 3-inch diameter bores. As shown in *Fig.* 3, the stone is mounted in a plastic holder with the entire leading side and cutting face of the stone exposed. This permits full, unimpeded flushing by the coolant at all points of cutting action during the entire honing cycle. None of the coolant can be wiped away ahead of the cut by action of the stoneholder.

Little or no breakage of the plastic or the stones occurs in service because the plastic holders are mounted independently of the abrasive, the stones are mounted separately into the plastic holders with cold cement followed by heat setting and no third material is required for reinforcement because there is no stressing of the plastic. Plastic mounted stones have recorded more than 50 percent savings in stone replacement costs and as much as 250 percent increased stone life in some production installations.



Stone Assemblies Are Simple

Stone and metal shell assemblies, also shown in *Fig.* 3, feature a simplified shell design that assures solid cemented backing and support over the full base area of the stones for larger tools. These units seat properly in the stoneholder.

Another development, for honing the large diameter, short-length crank-end bores in connecting rods, uses expandable tool guides that operate entirely independently of stoneholder expansion, *Fig.* 4. Because the guides feed out uniformly under light pressure at all times and with separate control,

Fig. 4. Connecting rod honing tool shows the carbide tips of the size control gage above the honing head.

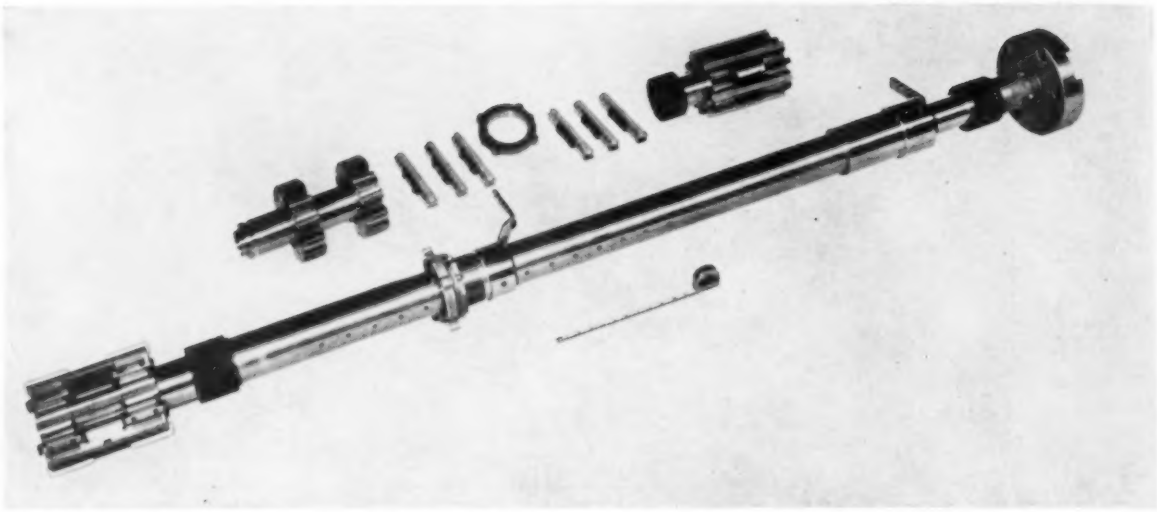


Fig. 5. Honing tool with interchangeable heads and gages will size bores of tubing used for hydraulic cylinders. Size gage can be adjusted to any point on its nonrotating sleeve to gage any portion of a bore.

thin-walled or assembled bores can be honed without distortion. Toolguide expansion is completely independent of any hydraulic pressure on the tool and cone expansion system, and the guides are completely independent of the size-gaging mechanism and function. Also, centering of the tool and its guides in the bore is unaffected by uneven stone wear which may occur with nonrigid drive-shaft tools.

Reduces Cost and Improves Quality

An installation of connecting rod honing tools, *Fig.* 1, crank-end bore finishing of two stacked rods per spindle, was approximately stabilized with the following results:

Bore diameter, inch	2.3745-2.3750
Bore length, inch	0.9915-0.9955
Stock removal, inch	0.0020-0.0030
Uniform size within, inch	0.0002-0.0003
Out-of-roundness within, inch	0.00015-0.00020
Bellmouth or taper	none measurable
Rods per hour per spindle	800
Rods per set of stones per spindle	800
Honing cycle, sec	10-15
Stone cost per piece	½ former cost

After the first three months of production, it was estimated that, as compared with other available tooling, potential yearly savings of more than $10,000 were possible with better size control and better quality. In a recent installation of similar tools for honing the piston pin bores in connecting rods, approximately 95 percent of the bores were reported held within 0.0001 inch.

The honing tool equipment shown in *Fig.* 5 has recently been installed on a horizontal machine to finish seamless steel tubing for hydraulic cylinders used as lifts in earth-moving machinery. Bores range from 5¼ to 6⅝ inches in diameter and from 14¾ to 40⅝ inches in length. Desired stock removal may vary from 0.010 to 0.020 inch if a previous boring operation is used, or from 0.030 to 0.040 inch from the rough. Uniform final sizing will probably be held within the limits of 0.0005 to 0.0007 inch.

This may be the first installation in which large diameter bores, above approximately 2 inches, will be automatically sized during a horizontal honing operation, thereby introducing tremendous savings in time and cost for tubing bore production. Previously, it was necessary to withdraw large-diameter long-length honing tools during horizontal honing and insert special long-length gaging devices for progressive or step gaging throughout the length of the bore. In this process, total gaging time is usually many times the total honing time required.

Heads Are Interchangeable

These tubing tools provide for selective, quickly adjustable positioning of the size gage on the nonrotating outer sleeve of the tool. Also, quickly interchangeable honing heads and split-type size gages minimize the time required for changing production from one part to another. For a particular group of bore diameters, the larger diameter tool bodies are designed for use with the same rigid drive shaft and cone as for the smallest diameter tool body. All bodies are assembled with a simple, split-ring connection for quick interchangeability.

New developments in honing, and the improved results achieved, appear to indicate unusual progress in dependable, low-cost sizing and finishing of cylinder bores in high production. Since honing tools can remove appreciable stock and control finished size, honing should become an important and dependable process.

Fig. 1. Trunnion beam and barrel assembly being welded by the semiautomatic hidden-arc process. The beam is rotated by a positioner.

Hidden-Arc WELDING Speeds Production

By Charles N. Aronson

President and Chief Engineer
Aronson Machine Co.
Arcade, N. Y.

BECAUSE of the large amount of welding involved in the fabrication of positioners, the use of semiautomatic hidden-arc welding equipment is justified even though production runs are unusually small, from five to ten units at a time. Typical is the fabrication of the trunnion beam and barrel assembly shown in *Fig.* 1, a vital component of the positioner design. This part is made from three lengths of steel channel joined by longitudinal welds. A steel barrel, welded to the channels, takes the roller bearing for the positioner table spindle.

Two of the channels are welded internally flange to flange by the manual method. A low-hydrogen type electrode, 3/16-inch diameter, is used to weld the 3/8-inch flanges. This not only holds the two parts together but burns out rust, which is always on channel edges, and prevents pitting in the external welding, which is done later by the semiautomatic hidden-arc process, using a Lincoln Electric Co. "Squirt" welding gun, *Figs.* 2 and 3. The third channel is welded in the same way to the center channel.

The barrel is welded to the beams, also by means

of the Squirt gun. This is hand welded inside to the center channel before assembly of the channel and then is hidden-arc welded on the outside, *Fig.* 1.

Although the barrel is premachined within ± 0.0005-inch limits, there is never more than 0.0005 runout or shrinkage, partly because the beam holes are held within ± 0.0005 of specified diameter and also because the process makes for minimum and uniform shrinkage.

Welding the trunnion assembly is done on the inclined table of a 3000-pound positioner. For Squirt welding the barrel to the beams, the current is 400 amperes; the speed, 20 ipm. For welding the channels together by the hidden-arc process, the current is 375-400 amperes, with the speed up to 25 ipm. The slightly higher speed is feasible with rolled structural steel. In similar setups using lighter stock, speeds as high as 40 ipm have been attained. With good fit-up and internal welds previously made, burning through is avoided.

Eight Components Comprise Bull Gear

Another interesting unit in a positioner is the bull gear shown in *Fig.* 4 in one of its early production stages. This part, almost 3 feet in diameter, is made of eight separate components and requires nine circumferential welds of varying diameters. Except for tack welds and one deeply recessed weld that can be reached only by hand equipment, all welding on this gear blank is done with the semiautomatic hidden-arc device. The gear is rotated by a positioner while the welding gun is held stationary.

The blank produced by this design weighs 525 pounds, losing only 10 pounds in all machining operations. Total labor involved in producing the bull gear is less than 12 man-hours, including both welding and machine-shop time.

All hidden-arc welding work at the plant, such

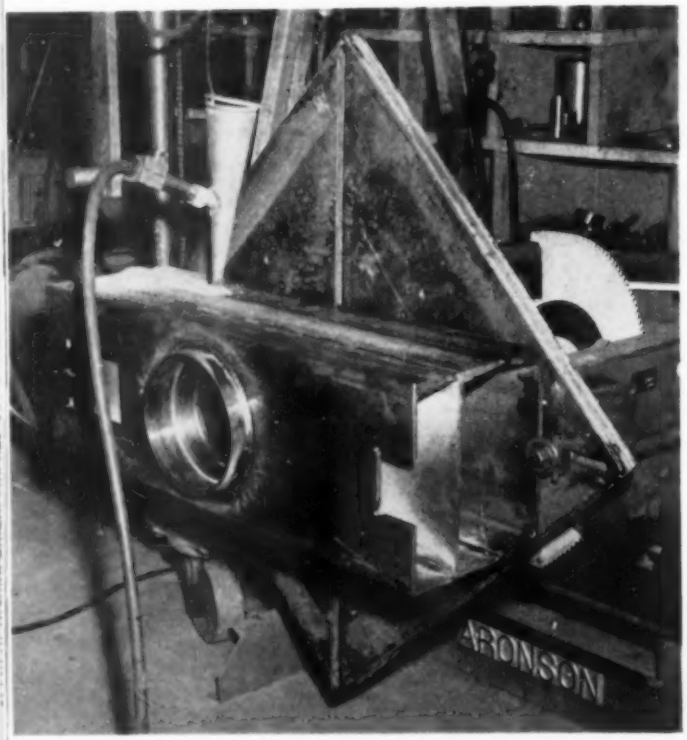


Fig. 2. (left) For external longitudinal welds joining channels, the gun is moved while the work is held stationary.

Fig. 3. (below) Close-up detail of welds showing uniform quality.

as on the trunnion beam and bull gear, is performed with a specially designed A-frame rig. With this equipment, which is built on casters to make it easily portable, the welding gun can either be fixed in any desired position for circumferential welding or mechanically moved on a horizontal beam for straight-line welds.

The rig is built on a pair of A-frames tied together by a welded structure. A clamp grips the welder hose close to the flux cone and holds the gun vetical or at any feasible angle. The clamp is supported in turn on a carriage arranged for a horizontal traverse of 60 inches along a beam. To make the beam adjustable for height, it is supported on sleeves and moved up and down on vertical tubes at each end of the beam by motor-driven chains.

Iron-Powder Electrodes Facilitate Welding

All welds on the chassis of the positioners are made with iron-powder electrodes. These electrodes produce high-quality welds at about three times the rate attained with conventional rods. Moreover, weld spatter is minimized, considerably reducing cleaning costs.

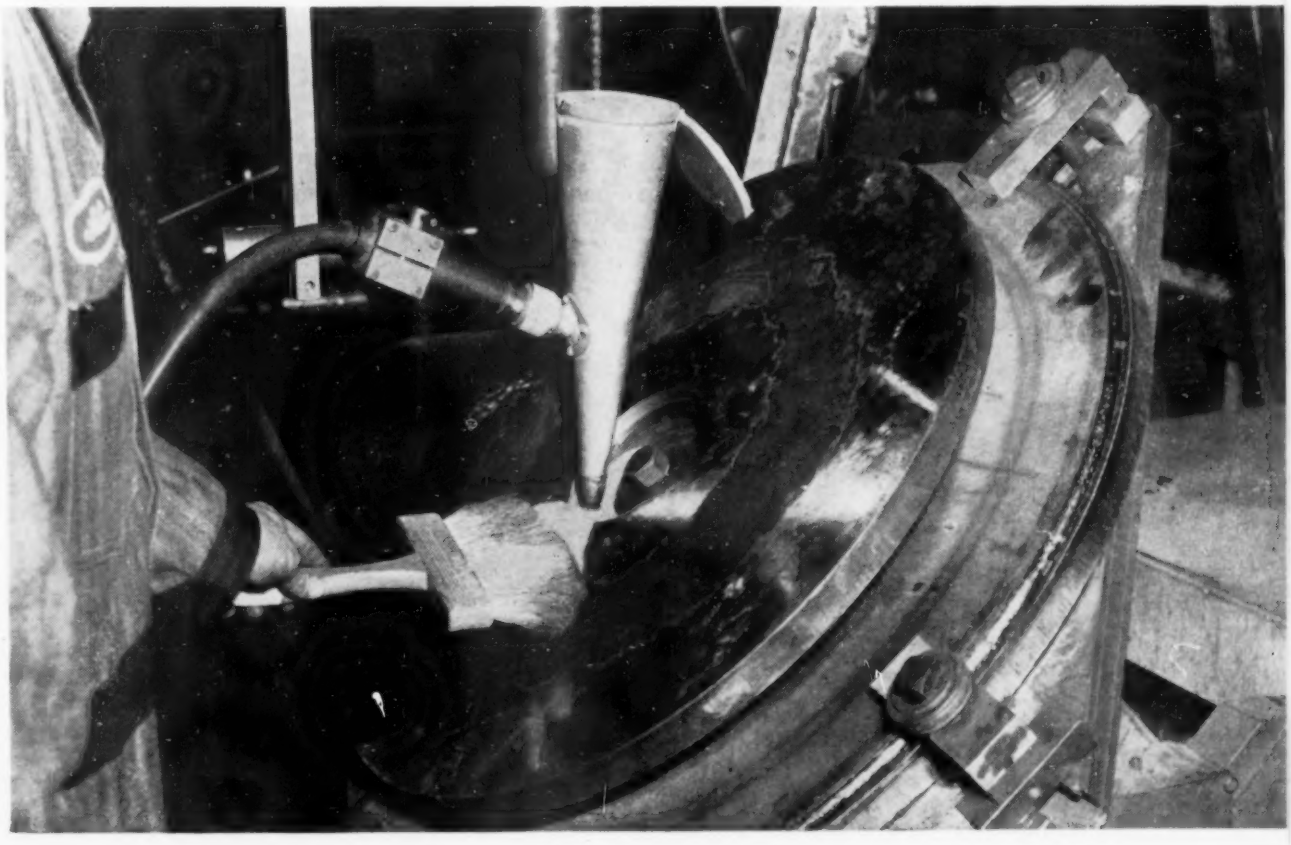
Since fastest operation of this type electrode is in a down-hand position, the chassis work is expedited by mounting it on a positioner and tilting it to the required angle. In many cases, the operator can stand on the flat top of the positioner where it is convenient to reach the down-hand work.

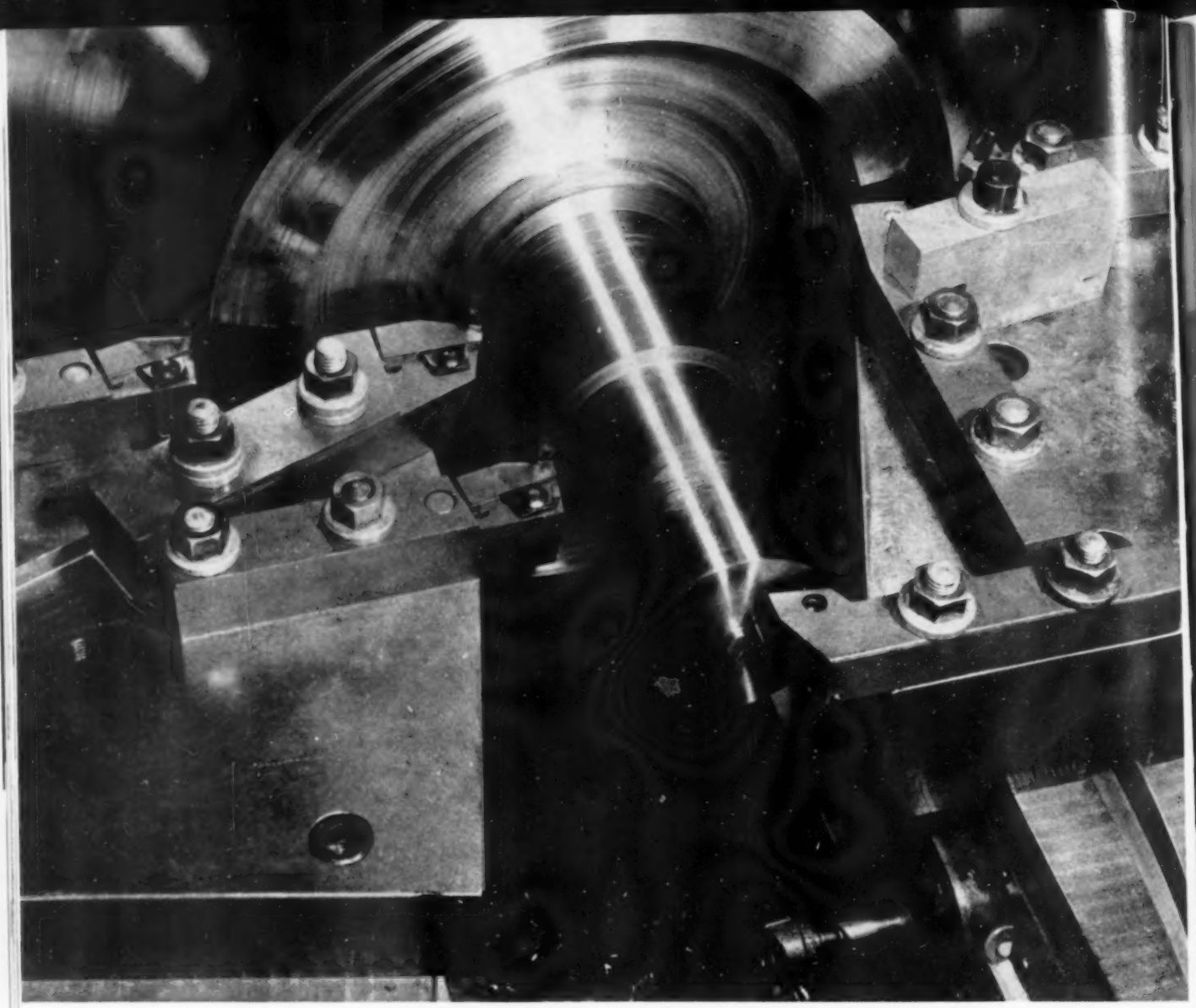
Iron-powder electrodes are also employed in fabricating the rotary tables of positioners, some of the welds being of the intermittent type. These intermittent welds are made five times faster than those previously made by hand welding with conventional coated rod. As previously noted, a threefold increase is normal; the extra time is saved in the repeated startings required in making the intermittent welds. With iron-powder electrodes, each start is quickly and easily made.

Producing positioner tables involves welding channels to plates and to each other to form T-slots. The T-slots accommodate bolt heads used to fasten weldments to the tables in service. The channels also constitute stiffening ribs for the two plates that form a sandwich with the channels between.

There is some warpage of the individual plates caused by welding, but the warpage in one plate counteracts that in the mating plate when the two are clamped together for the welding of the final assembly. As a result, tables that are 54 inches square do not vary more than 1/16 inch from true flatness, which is noteworthy in a weldment of this type and size.

Fig. 4. Blank for bull gear. Almost 3 feet in diameter, it is made of eight separate components welded together.





SIMPLIFIED quick-change tooling eliminates regular tool blocks by bolting toolholders directly to riser plates on machine carriages. Operation is rough machining of SAE 8620 drive gear forgings on 50-hp Gisholt automatic lathe. Feeds of 0.006 to 0.012 inch were employed at 240 sfpm. with Kennametal standard clamped insert tools.

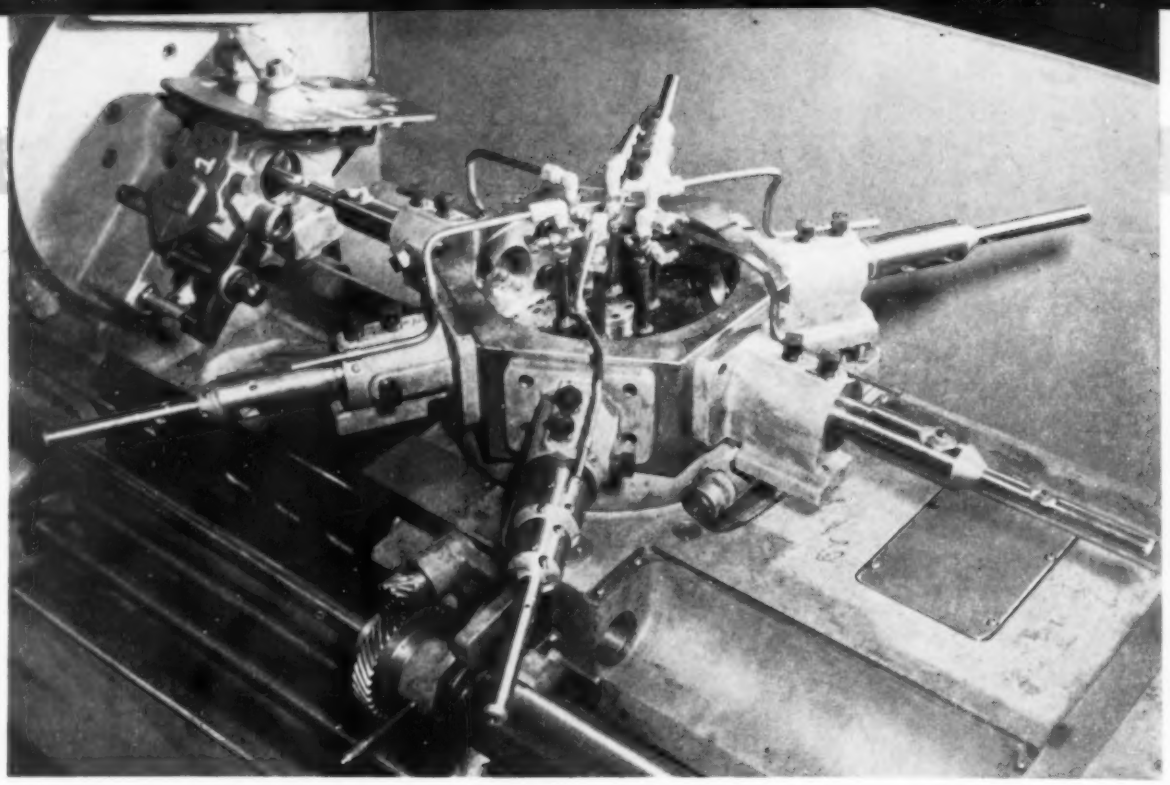
TOOLS at work

CONTOUR TURNING with electronic controls speed finishing of mill rolls up to 18 feet in length. The carbide cutting tool reproduces template contour through a stylus contact to an accuracy to 0.001 inch. Operation is continuous through a maximum cut of 7/8 inch with feeds of 0.060 to 0.100 ipr. Metal is removed up to nine times faster than by manual operation.

—Photo courtesy Mackintosh-Hemphill Div. E. W. Bliss Co.

PNEUMATIC SCREWDRIVER feeds and drives screws in this semiautomatic assembly operation. Operator holds workpiece in position on fixture and pulls handle to actuate the special fixed-spindle machine at Progressive Wood Heel Co., N. Y. An 800 percent improvement in output is secured with this setup over previous methods.

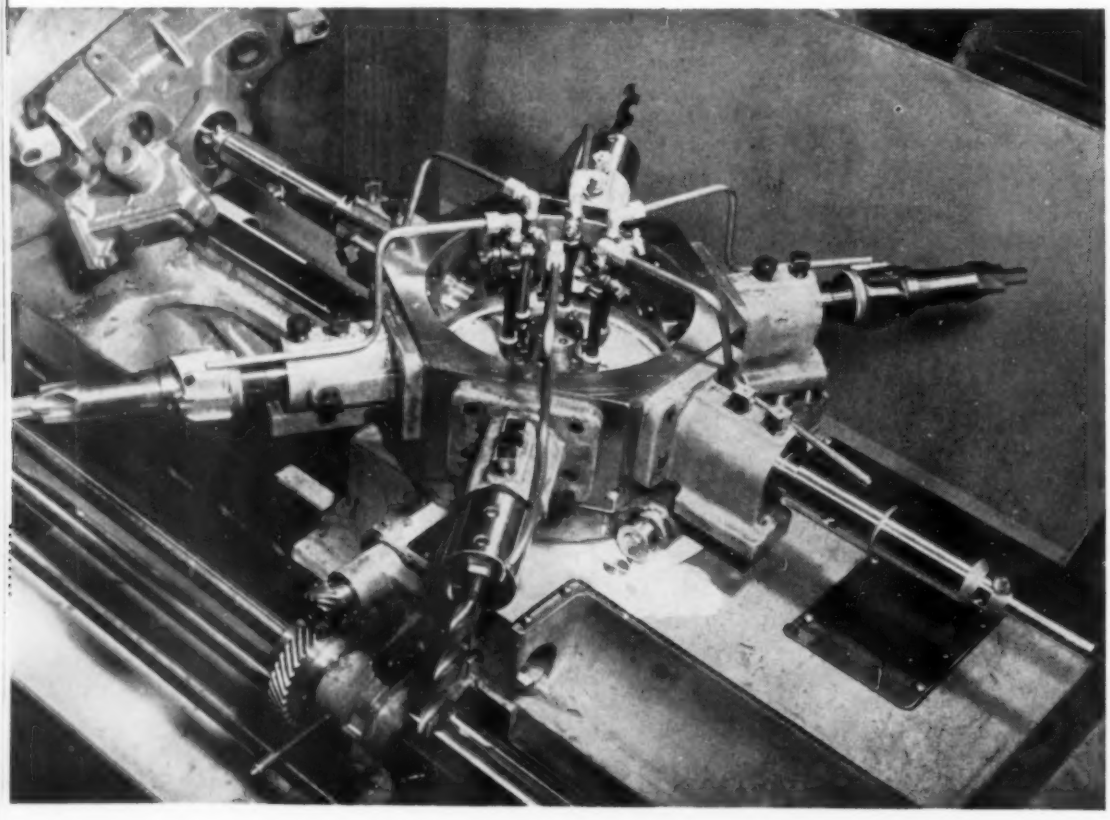
Photo courtesy Pneuma-Service, Inc. Cleveland, O.



MACHINING TIME (above) on cast-iron steering gear housing is pared in automatic turret lathe. After rough drilling, multidiameter cutters machine 3 diameters at rear and one at front of housing and also form and chamfer in first operation. Microbore tooling then finish bores. Work is held in special fixture with angular location from machined base. Floor-to-floor time is 3.25 minutes.

In second operation (below), part is held in special fixture with arbor for locating in front and rear bores against machined face. Front and rear diameters are rough, semifinish and finish bored. Piloted microbore tooling permits holding 0.0005-inch tolerance in small rear bore. Floor-to-floor time is 3.50 minutes.

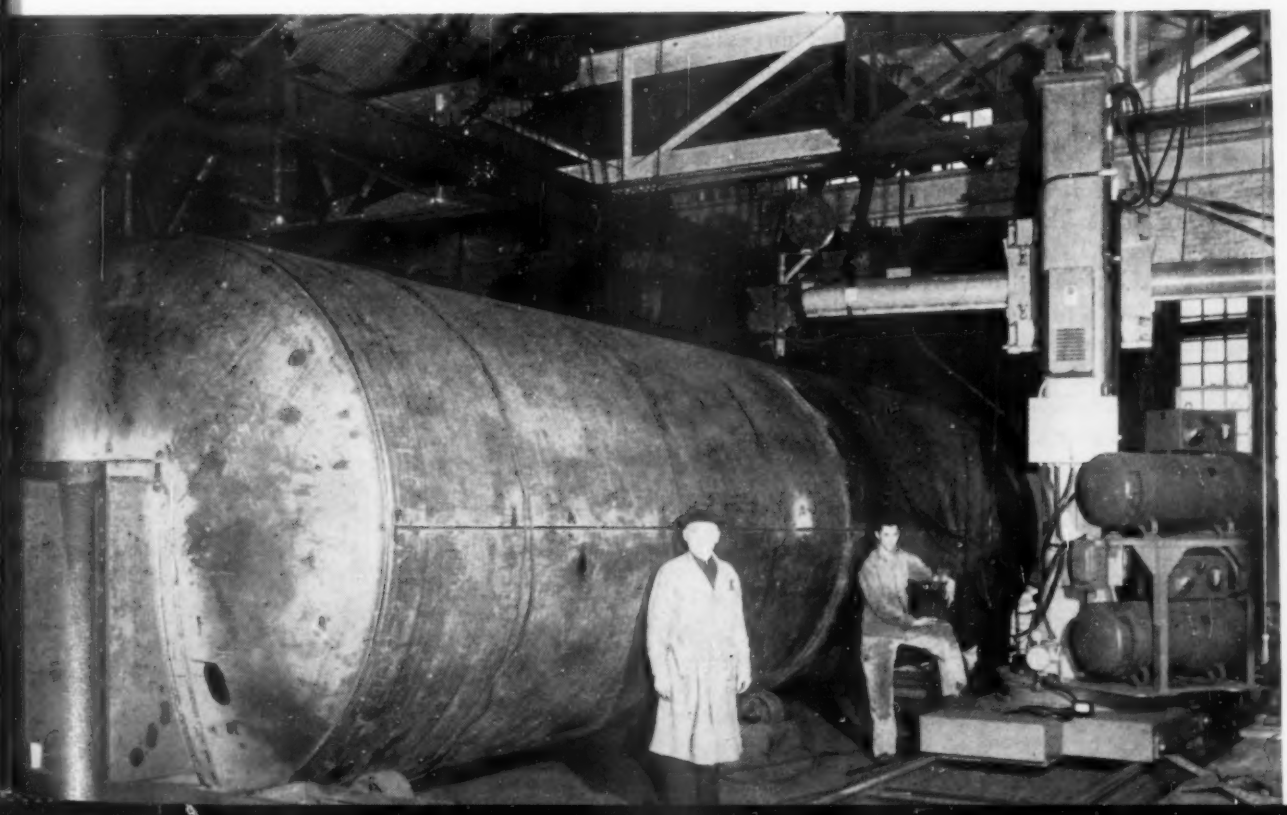
Photos courtesy Gisholt Machine Co.



TOOLS at work

MULTIPLE WELDING OPERATION is performed on automobile rail at Ford Motor Co. Rouge plant to assemble steering gear spacer and body mounting brackets. The spacer is joined by an edge projection weld at 6 cycles, about 2000 lb force and 18,000 secondary amp. The brackets are joined by preformed projections 0.050 in. high, using 2 cycles weld time, about 5000 lb force and 55,000 secondary amp.

SUBMERGED ARC WELDING assembles tank 32 feet long x 9 feet in diameter at Boom Boiler and Welding Co., Cleveland, O. A Lincoln welding head is mounted on a ram with 12 feet vertical travel, speed range to 72 ipm. Limit switches prevent overtravel. A rotator provides 360-deg motorized rotation. V-type wheels ride in machined ways guiding both vertical and ram travel.



practical methods of introducing

Quality Control

By Thomas J. Bizzoco*
Manager Quality Control
McLean Development Laboratories
Copiague, L.I., N.Y.

WHILE IT IS IMPOSSIBLE to manufacture errorless parts, errors can be controlled if the cause is known. Detection of a faulty operation, tool or method of doing a job, if discovered and corrected before completion of the parts, will save money and time, and will improve quality. Large sums of money are spent annually on new machines, tools and other production equipment in order to improve end products. Yet few quality-minded companies have taken their employees' attitudes into consideration in the effort to improve quality.

It is axiomatic that pride in workmanship is quality control. Therefore, installation of a strict quality control program in a machine shop should not be a difficult problem. If a system is to be accepted it should, however, avoid posing a formidable technical challenge to production employees. The introduction should be graded systematically. The representative of management in the shop, namely, the foreman, must be thoroughly schooled in the system before introduction of the plan.

Employees and their families can be induced to cooperate and become enthusiastic supporters. For instance, company publications can be used to pave the way for a new program. Such communications, addressed to both husband and wife will increase quality-mindedness in the plant. They can be packed with information written in a simple, readable style giving a basic explanation of quality control and what it means in relation to customers' good will, job security, etc. Although hardly a complete solution to the problem, this approach will give a good start on the goal. Care must be exercised, however, in presenting the program to the employee.

He must clearly understand that the analysis chart, *Fig.* 1, serves only as a detector of errors and to improve product quality. For his benefit, the chart can be made with color bands, simplifying his interpretation of it. For instance, the area of acceptable work may be green, the borderline area yellow, and the out-of-tolerance area red, to be a stop-work signal. With this arrangement the operator need not know the theory behind the chart nor study the average line. His pride will make him try hard to keep the average line well within the green range.

Facts presented graphically serve as a guide to production control, engineering, methods and other departments to continue the operation as is or to change the setup as required. The statistical methods involved need be of no concern to the operator. The important thing to make quality control a practical matter is to secure the workers' cooperation to produce more and better at all times.

Incentives have been used in many plants but only a few have gained the desired results. Most plans sacrifice quality for quantity. Personal and departmental pride, however, will greatly improve product quality if a graphic display is installed in

*Senior Member ASTE Greater New York Chapter

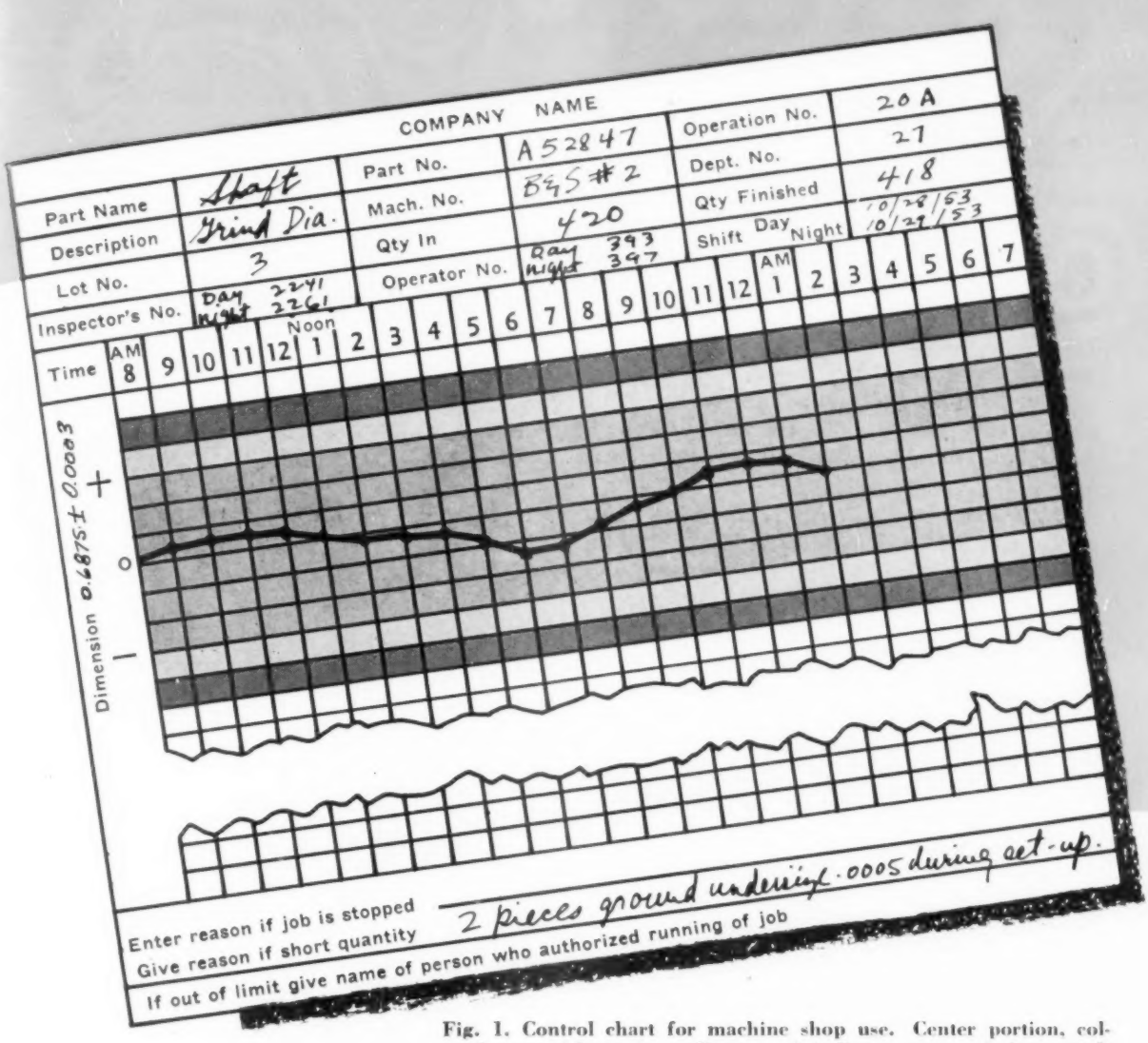


Fig. 1. Control chart for machine shop use. Center portion, colored green (shown in medium tone) indicates process is in control. If average line reaches yellow border (light tone) caution is indicated. Production should be stopped when line passes into red portion (dark tone).

Fig. 2. Sample departmental chart showing record made in various processes for a given period.

Company Name								Period
Department	Total Parts Manufactured							7/7/53 to 10/27/53
	1000	2000	3000	4000	5000	6000	Over	
Lathe								Accept
								Reject
Drill Press								Accept
								Reject
Milling								Accept
								Reject
Punch Press								Accept
								Reject
Jig Bore								Accept
								Reject
Grinding								Accept
								Reject

each department showing the results, *Fig.* 2. This chart should be as large as 6 x 9 feet, if space is available. In any event it should be large enough and so conspicuously displayed as to be visible from all sides of the department. Its presence motivates teamwork and gives a department spirit to produce quality as well as quantity parts.

While all members of an organization should be made a part of the quality control program, frequency distribution, skewness and probabilities should be problems for statisticians and engineers rather than workers. Nevertheless, a chart showing product performance in the market as related to competitors' products can be used to help build morale and a feeling of job security. Simplicity in presenting the facts should be an important factor in this presentation, *Fig.* 3.

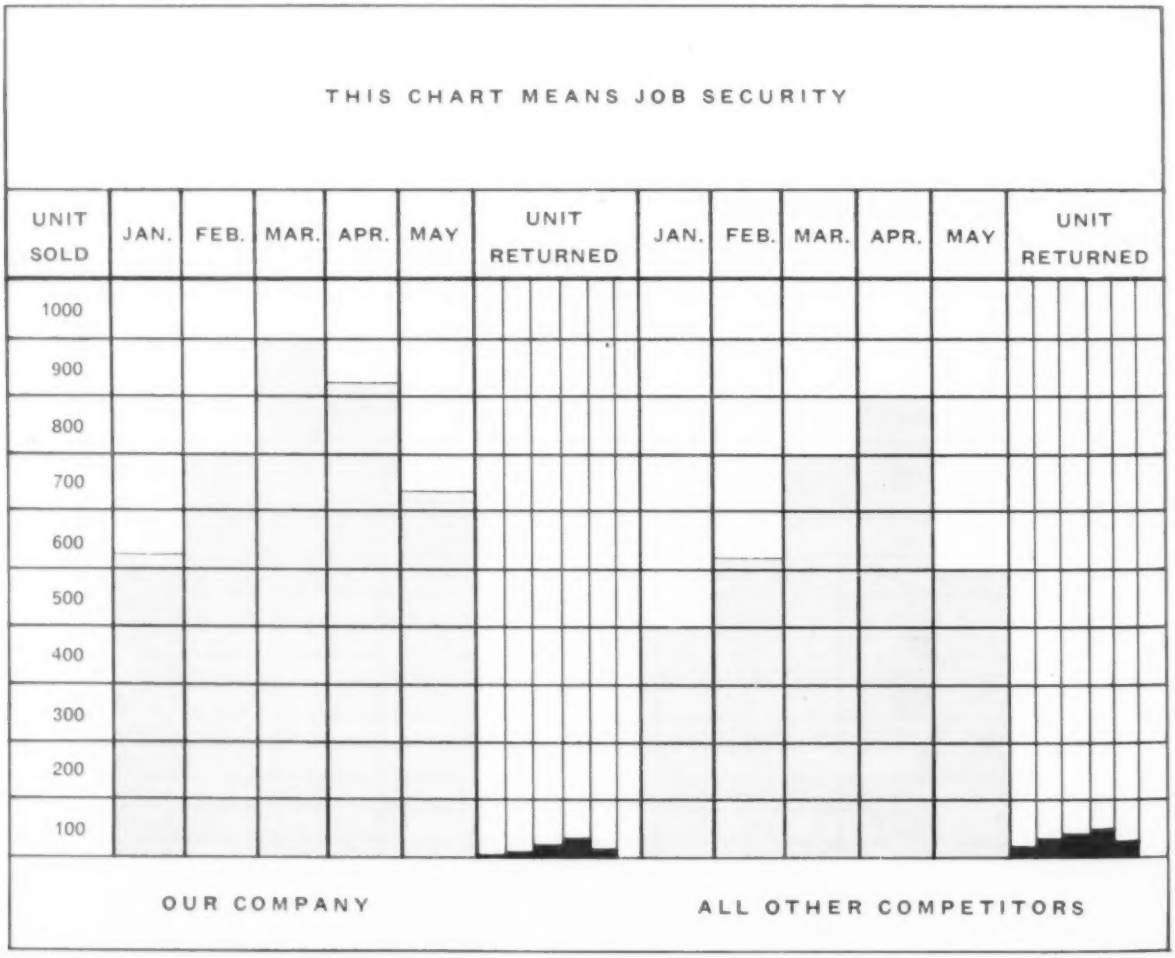
Many people think in terms of the past when an employee never knew the company's financial position. By contrast, the companies that show a profit today are those that share their problems with their employees. Quality control charts and methods can be relatively simple and inexpensive. Effort of the program should be concentrated on eliminating excessive production expenses, that is:

1. With proper gaging method, the inspection group can be small.
2. With a first-piece inspector and two or three floor inspectors, having authority to stop production when it proves out-of-tolerance, 100 percent inspection will not be required.
3. With suitable "move" tags furnished floor inspectors, finished work can be expedited rather than be held several days as is sometimes the case.

If tags are distinctively colored, traffic of parts through the shop will be facilitated. Green tags can be used for work that is ready to be moved to the next operation or assembly. When work is to be moved to inspection for 100 percent inspected the tag can be yellow. Such tags should indicate the department where the parts are to be moved, the next operation, date and inspector's number. The inspector will also note on the chart, *Fig.* 1, reasons why parts are sent to be 100 percent inspected.

Practical quality control is a team affair. The team consists of operator, inspector, manufacturing and engineering with cooperative management in the center.

Fig. 3. Simple chart comparing performance record of a company with its competitors.



Economical Tooling gives short run plastic parts

By C. E. Herington
Meehanite Metal Corp.
New Rochelle, N. Y.

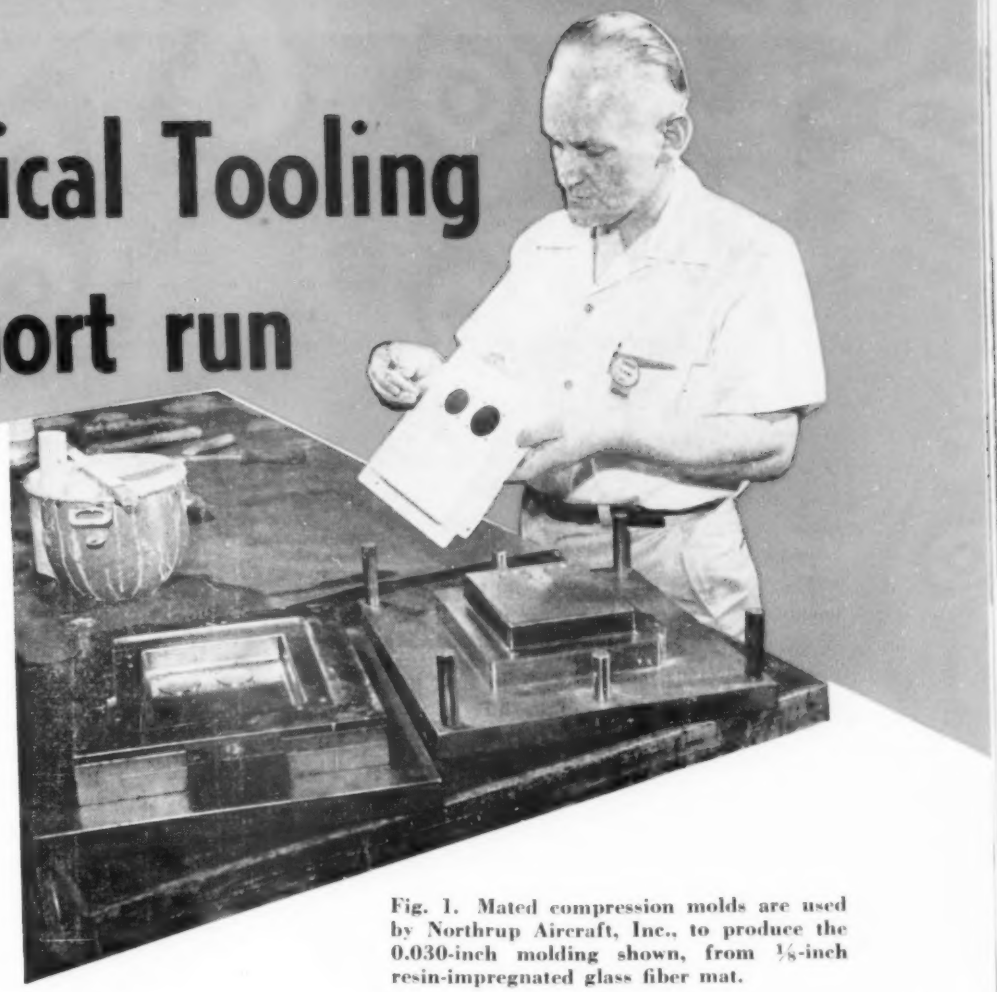


Fig. 1. Mated compression molds are used by Northrup Aircraft, Inc., to produce the 0.030-inch molding shown, from ⅛-inch resin-impregnated glass fiber mat.

COMPRESSION MOLDING, using heat and pressure, is the most desirable method of fabricating thermosetting plastics where high-quality standards must be maintained. Heretore the method has been regarded as unfeasible for manufacturing most airframe components because it necessitated the use of tooling which was too expensive for limited quantity production. Now, however, plastics are being compression molded in lots of 60 to 2100 parts at Northrop Aircraft, Inc., Hawthorne, Calif., using Meehanite tooling, *Fig.* 1.

Most compression molds in use at present are commonly made by machining solid steel blanks. Such tools are excellent for mass production purposes but ordinarily their cost is too high to be satisfactorily amortized in production runs under 500,000 pieces.

Where duplicate molds are needed, steel tooling costs can be reduced by hobbing, that is, by pressing hardened steel patterns into soft steel blanks. Hobbing, however, would be more expensive than machining if it were used to make single molds.

A number of plastics molders have used cast tooling where quantity requirements ruled out the possibility of using machined or hobbed steel cavities. But, due to deficiencies common in most castings, fabrication of these tools involved supplemental machining and plating operations, which made tooling costs prohibitively high for less than 10,000 pieces.

Meehanite castings of standard type GA have been found to be the answer in the Northrop plant, providing compression molds with exceptional economy. Such castings have two important advantages. First, they are free from defects and can be machined with minimum difficulty. Second, their grain structure and low porosity make it possible to use the machined castings as molds without plating.

Other considerations are that this tooling material has close dimensional tolerances in the as-cast condition and can be machine finished at a relatively low cost. Standard Meehanite type GA has good physical properties where high compressive

strength is required. Tensile strength of type GA is 50,000 psi, minimum. Yield strength is 47,000 psi, minimum, modulus of elasticity is 20,000,000 and Brinell hardness 207. Molds could be readily plated, if necessary, to increase their life span for relatively long production runs.

Most of the plastics being compression molded by Northrop at present are phenolic or polyester resins. All are glass-fiber reinforced, a majority with mat type materials, *Fig.* 2, although glass fabrics are being used as reinforcements in some instances.

Mat type reinforcements have the advantage of eliminating the need for considerable hand tailoring, since they make it possible to preform moldings. The preforms are produced by machine and then cured in a low-temperature oven prior to compression molding.

Four compression presses with capacities ranging from 75 to 150 tons are currently used by Northrop in the production of plastics parts with 105 different molds. Some molds are multicavity tools for the rapid manufacture of comparatively small parts.

The moldings are made at temperatures of 250 to 350 F with pressures of from 50 to 100 psi, in cure cycles ranging from 1½ to 20 minutes, depending on the nature of the resinous binder that is employed in each instance. Because these molds have shear edges, flash on moldings is so slight that it can be quickly removed manually by a shop knife, *Fig.* 3.

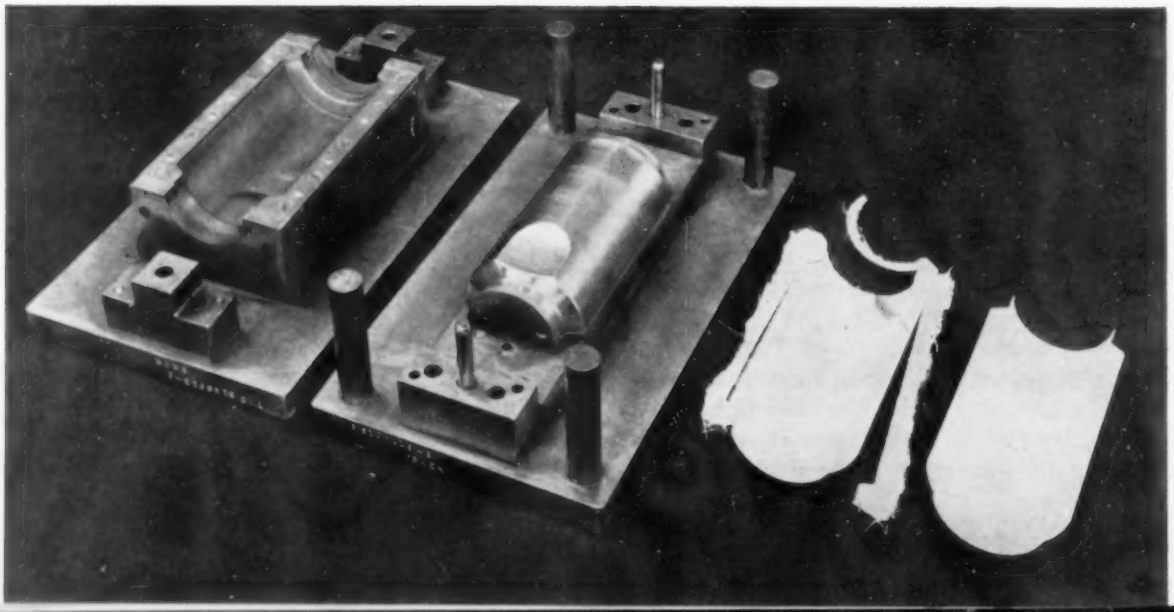
The largest parts that have been compression molded by the company are about 6 feet square; the smallest, about 2 inches square. They include such items as junction boxes, console panels, glare shields, air ducts, housings, aileron tips and electrical insulators for the Scorpion all-weather interceptor.

Many of these parts are used because they weigh less than comparable metal parts, yet have adequate structural strength. Other moldings are specified because of their excellent vibration resistance, high dielectric strength and chemical inertness.

Cost is seldom a basic consideration in the manufacture of aircraft components, since unusually high quality standards must be maintained. Northrop, however, has gained a considerable economic advantage in using plastics because they can be fabricated for much less than equivalent sheet metal products. For example, where as many as 20 different fabrication operations may be required to produce a deep-drawn stamping, a cup-shaped plastic component of almost any size can be made in only three or four production operations with molds which are usually much less expensive than progressive forming dies.

Fig. 2. (left) Glass-reinforced polyester preform is about to be positioned on a cast metal mold on one of Northrup's compression presses.

Fig. 3. (below) Matched compression molds with moldings produced. Shear edges on molds have partially separated flash. The second molding has been deflashed with a shop knife.



DRILL JIGS

from standard structural shapes

By Arthur J. Stockwell*

Assistant Supervisor
Aero Tool Design
Minneapolis-Honeywell Regulator Co.
Minneapolis, Minn.

ANY COMPANY THAT USES a large number of drill jigs should seriously consider introduction of standard jig boxes, *Fig.* 1. Savings in cost and time result from the use of such standards. One way of achieving these savings without sacrificing freedom in design is to use standard structural shapes to make a family of standard designs, *Fig.* 2. By using a limited number of sizes, an unlimited number of designs can be produced. The standard shape is selected and sawed to the length required for the particular application.

A dozen or so shapes and sizes of I-beam and channel sections usually prove adequate for the average tool crib. Stocked sections are rolled steel and extruded 61S-T6 aluminum. Since many drilled parts are small and require small holes, lightweight aluminum sections are valuable for jig fabrication. A small drill can center a light jig more accurately. If the same jig were made of steel, the drill would be pulled out of line and holes would not be within tolerances.

Most steel catalogs show various weights per foot for most standard structural widths. The heaviest sections should be stocked so there will be adequate support for the hinge pin when jig boxes are made.

Wear buttons are welded or hard facing is de-

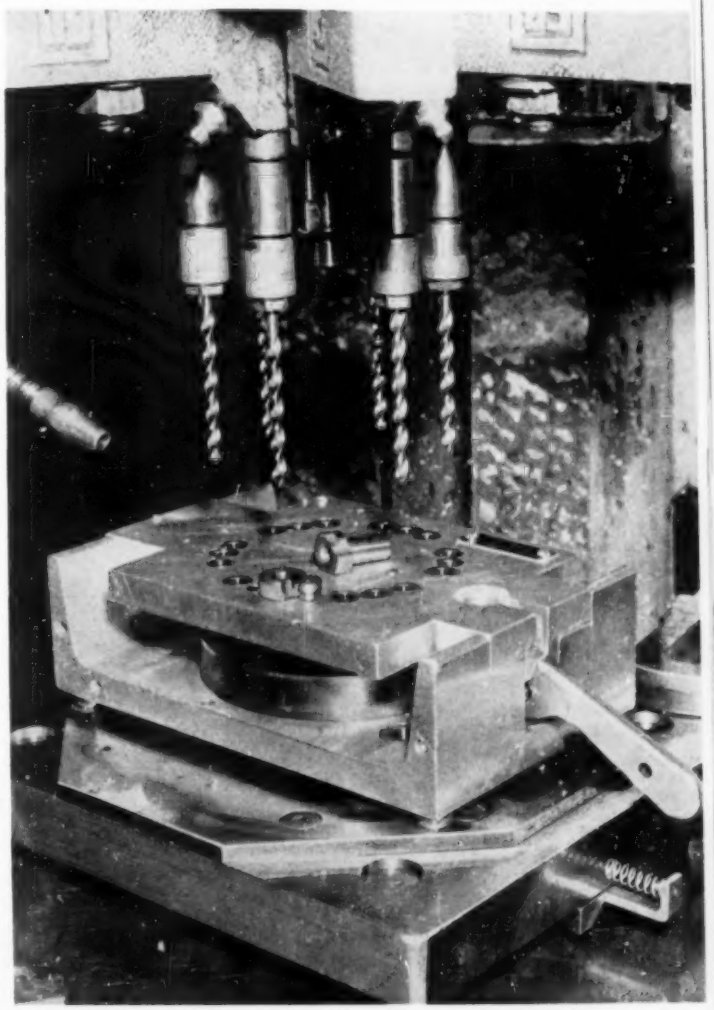
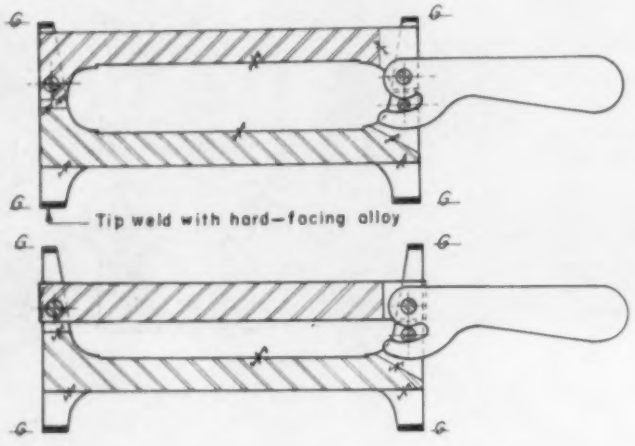


Fig. 1. Drill jig constructed of two aluminum channel sections. The jig is used for drilling 18 holes.

*Senior member ASTE Twin Cities chapter.

Fig. 2. Typical standard box type drill jigs made from I-beam section and plate, bottom, and I-beam section and channel, top. Cam handles are standard and interchangeable. Standard boxes have been designed with 3, 4, 5 and 7-inch structural shapes.



Note:
Jig body to be normalized before finish cuts are made.
Finish only surfaces marked "f" or "G"
Mill scale on Jig body and channel iron leaf to be left on unless necessary to finish a surface.

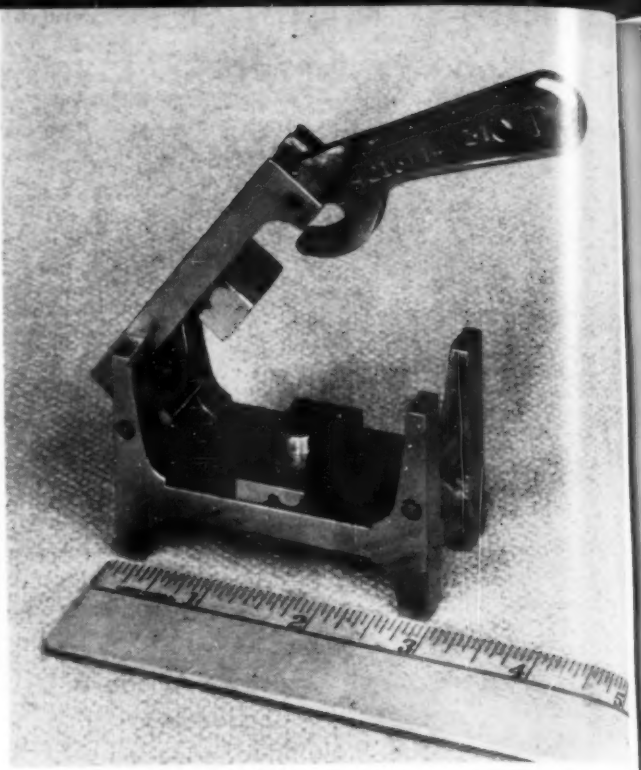
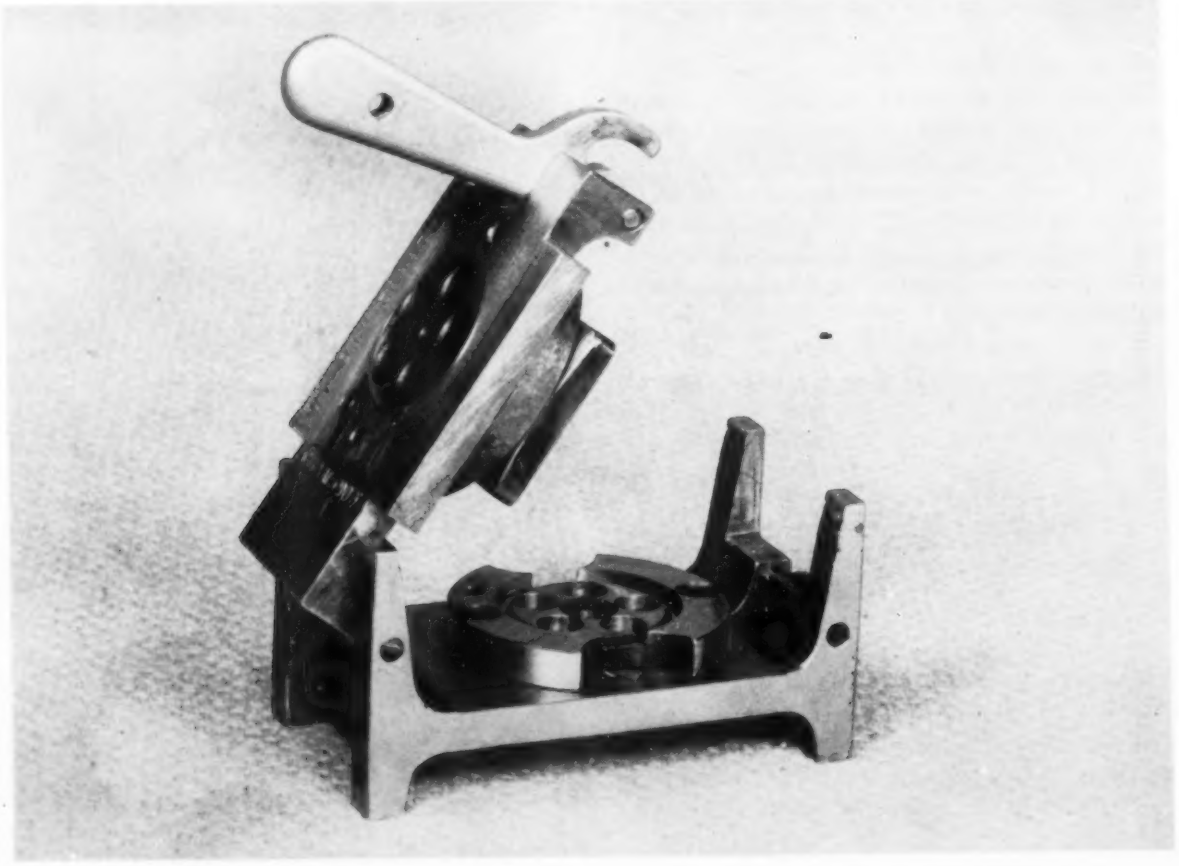


Fig. 3. (below) Drill jig made of a standard channel section hinged over a standard I-beam section.

Fig. 4 (above) Simple lines of drill jig made of standard structural shapes are apparent.



posited on the bottoms of the structural shapes, *Figs.* 1 and 2. Welding assures long life because wear resisting units do not come off or loosen. Hard facing or buttons are applied before any squaring cuts are taken on the steel shape.

Since the steel shapes are hot rolled, little distortion occurs after jig boring. It is obvious that jig boxes sawed from the solid or made of cold-rolled plates are more expensive to fabricate than those made from structural shapes.

The multiple drill jig of *Fig.* 1 can be indexed by a mechanism on which it is placed. In three positions, 18 holes are drilled. Upon completion of the drilling, the jig is lifted off the indexing base and one of the holes is reamed to a larger size on a nearby drill press. The jig is easy to handle during such a transfer operation because it is only about six inches square.

Greater space can be made for the part in the jig box by inverting a channel section over an I-beam section and hinging them together, *Figs.* 3 and 4. Such standard jigs have pleasing lines yet require a minimum of finishing work. In the case of steel sections, no exterior cleanup cuts are taken except where absolutely necessary. In most cases, the mill scale is left on the shapes.

Standard structural shapes need not be limited to application as drill jig boxes. A tapping fixture made from an I-beam section is illustrated in *Fig.* 5.

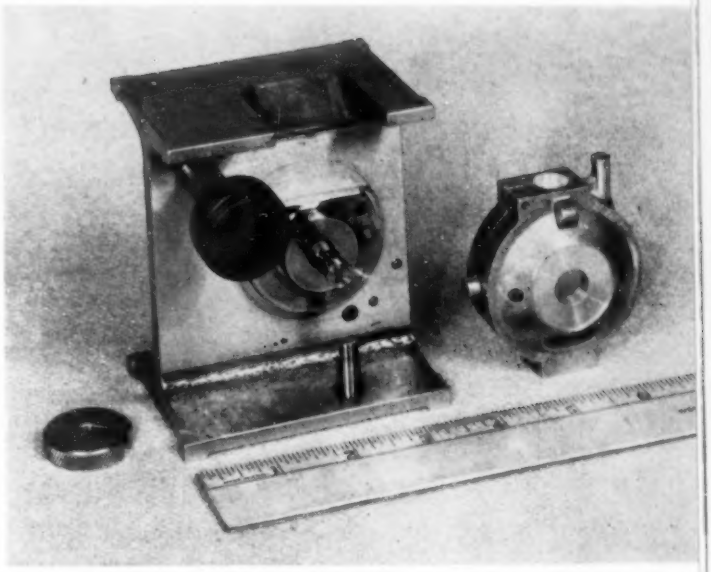


Fig. 5. Similar in design idea to the standard drill jig boxes, this tapping fixture is constructed from a standard I-beam section.

Stock shapes actually result in greater freedom in design than was formerly possible with standard stock jig boxes. All the advantages of reduced time and expense associated with stock boxes are realized p'us the freedom from limitation on length.

Smoother Tubing from Improved Process

METALLURGICAL AND MECHANICAL improvements in tubing and pipe are growing out of a new welding technique developed at Trent Tube Co., a subsidiary of Crucible Steel Co. of America. In the Trentweld method, by which the weld bead contour can be closely controlled, stainless and high alloy tubing is formed by a continuous mill consisting of a series of horizontal and vertical rolls. Flat rolled metal strip passes through the driven forming rolls and is gradually shaped from flat to a circular cross section. Because of this cold forming procedure, both sides of the stock are exposed for close inspection.

To seal the tubing, the rolls of the mill are inverted and the welding is accomplished from the underside. By this approach gravity automatically prevents formation of a weld bead on the ID of the tubing. The finished tube, even in the as-welded condition, has a smooth and flawless interior surface. The weld bead on the outer diameter can be held uniform and smooth so a surface finish can be obtained similar to the surface of the original metal. The external bead can be reduced by swaging and the mechanical properties improved without undesirable side effects.

The method is an adaptation of an inert-gas shielded-arc procedure developed some time ago by engineers of General Electric Co. Heat is generated by an arc struck between a nonconsumable tungsten electrode and the work. The arc occurs entirely in a shielded atmosphere of inert gas, such as helium or argon, while the arc length is automatically maintained. No additional metal is required; the weld is a complete fusion of the butted edges of the strip.

Several advantages have evolved from the technique. Tubing and pipe are said to have improved fabrication properties for tube assemblies; many of the high temperature alloys or superalloys can now be rolled into tube sheets, rather than welded in as formerly. Corrosion resistance has been improved because of the absence of grooves or valleys.

Because of the development of the new process, alloys which have not previously been considered suitable for welded tubing are being investigated with this purpose in mind.

Principles of correct die shank location

By Federico Strasser

Santiago, Chile

CUTTING DIES for blanking or punching should be mounted so the cutting pressure is uniformly distributed over the cutting edges. If the axis of the shank holder does not coincide with the center of cutting force, side strain will result. Unless lateral thrust is prevented or compensated, displacement between punch and die may lead to shortened tool life, nicked cutting edges or broken die plates. Guide columns and bushings also may be damaged through incorrect location of the shank holder.

Correct location of the shank in the exact cutting or pressure center is especially important when blanks are large and cumbersome, made of heavy stock or have high shear strength. Proper location is equally important when the tools have floating adapters or the press is used near its capacity.

Cutting centers of geometrically regular blanks are easy to determine since they coincide with the geometrical center of the figure. Other shapes, however, require calculations for determining the center of force. The effective center of cut, *Fig.* 1, of a circular arc is given by the following formula, for the centroid.

$$x = \frac{2(180)}{\pi\,\alpha}\, r \sin \frac{\alpha}{2}$$

where

r = radius, inches

x = distance between center of circle and effective center of cut, inches

α = central angle, deg

For the most commonly used arcs, approximate values for x are:

$x_{180} = 0.64r$ (half of a circle)

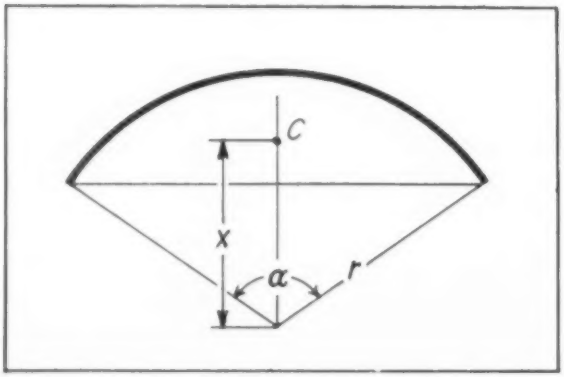
$x_{90} = 0.90r$ (quarter of a circle)

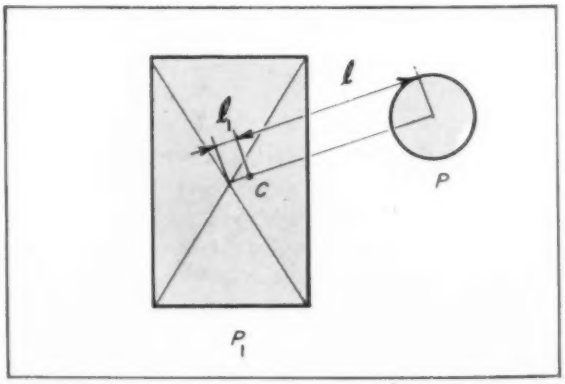
$x_{60} = 0.95r$ (sixth of a circle)

If a tool is designed with two geometrically regular contours, *Fig.* 2, the cutting center is determined

Fig. 1. (left) Effective center of cut for a circular arc.

Fig. 2. (right) Cutting center for two separated, geometrically regular contours.





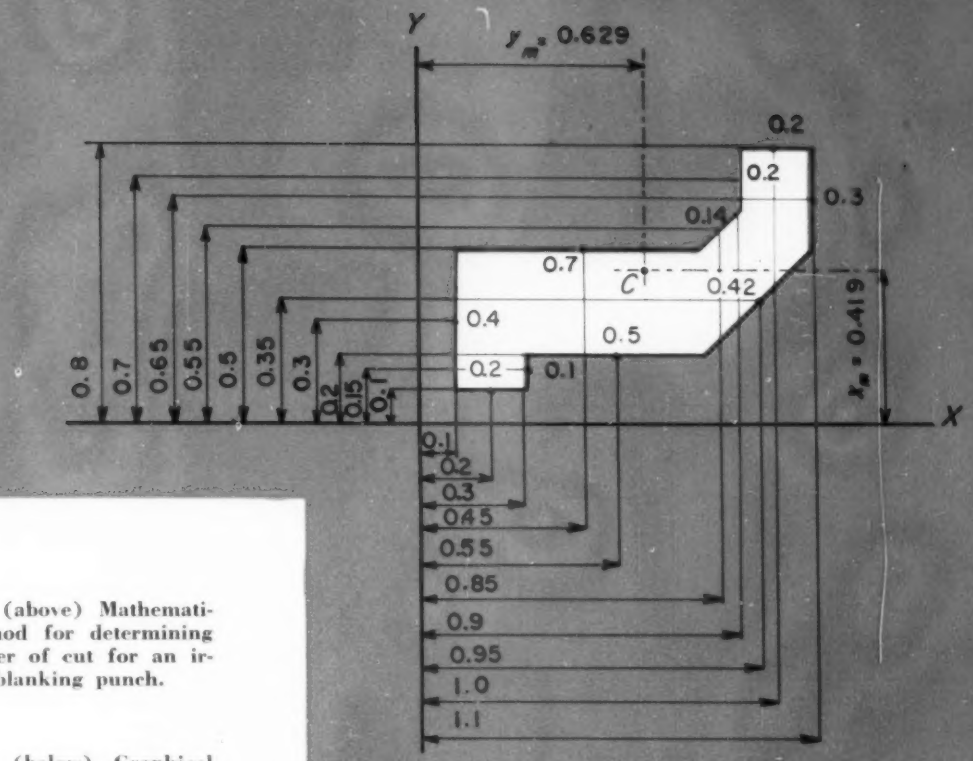
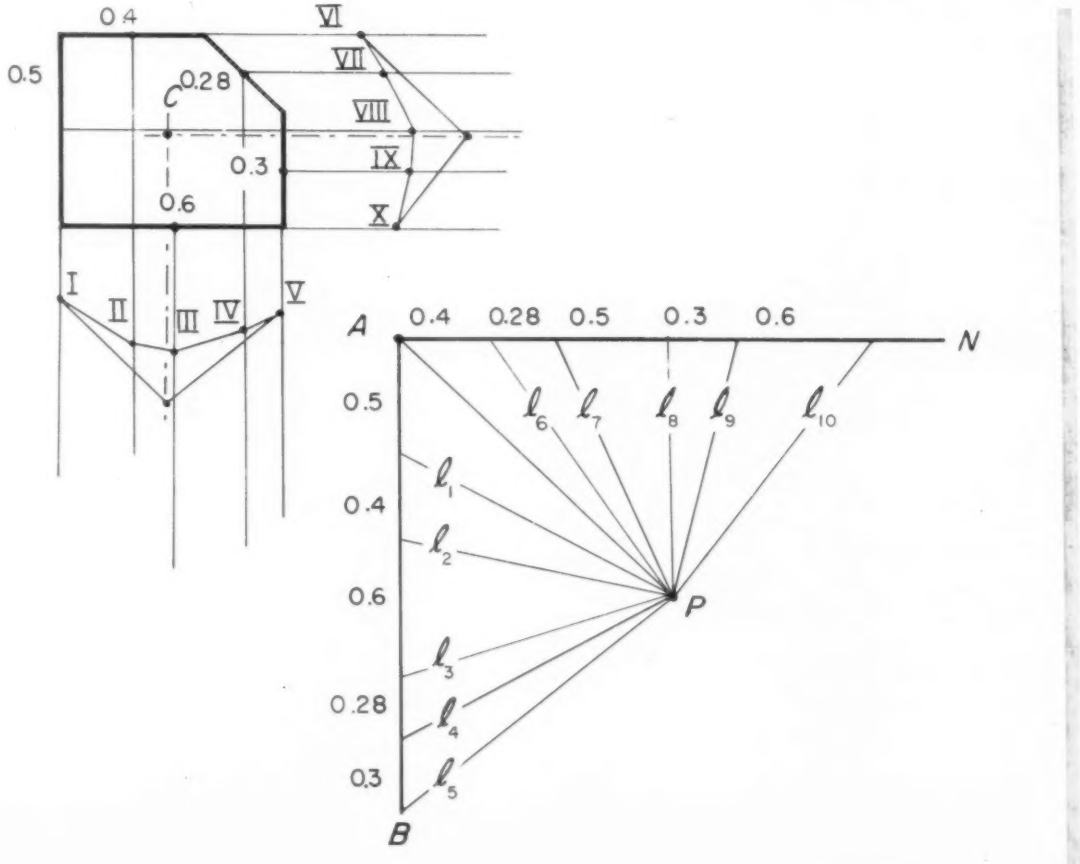


Fig. 3. (above) Mathematical method for determining the center of cut for an irregular blanking punch.

Fig. 4. (below) Graphical method for determining the center of cut is based on same principles used in force polygon solutions.



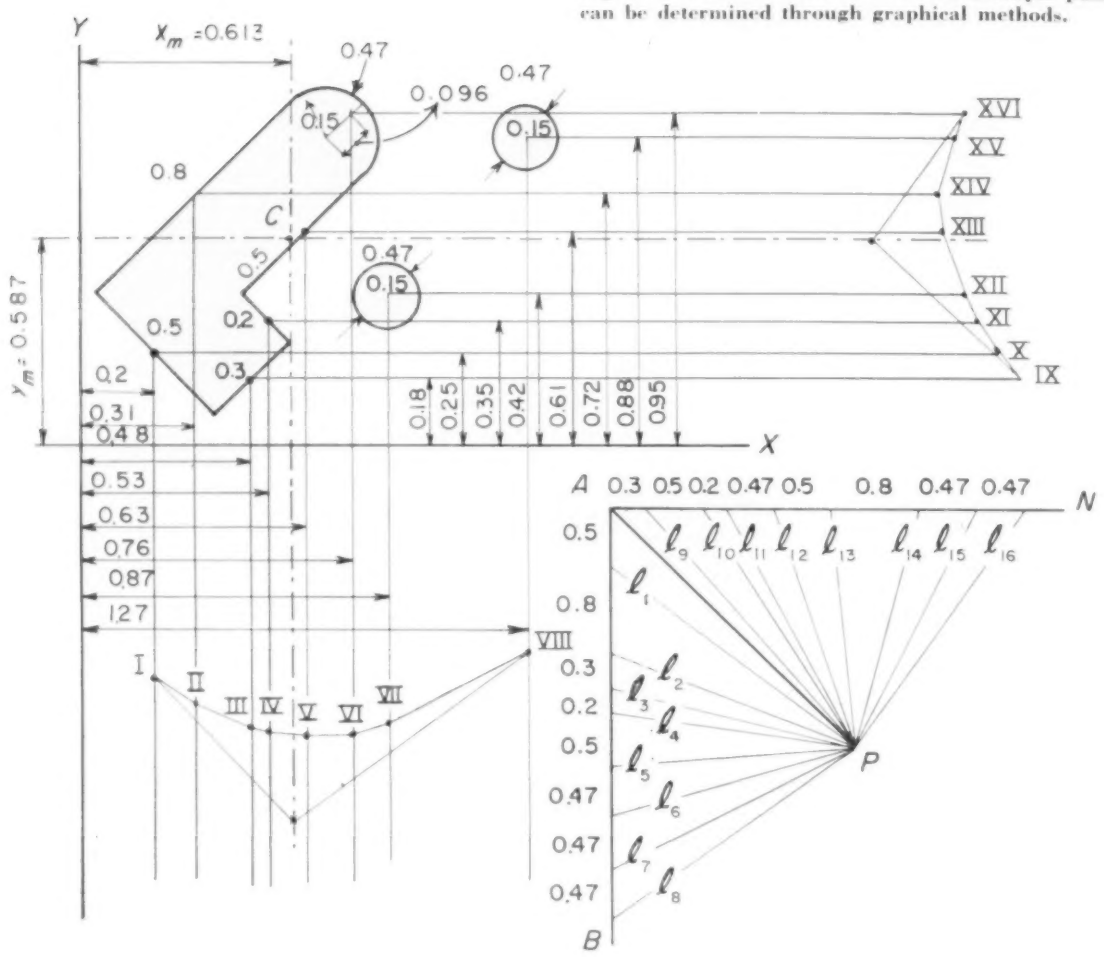


Fig. 5. Effective center of cut for a multiple punch can be determined through graphical methods.

by the relationship between their cutting perimeters, not the punch areas. The geometric centers are joined by a straight line and this line is divided into two parts in inverse ratio to the perimeters. Point *C*, *Fig.* 2, represents the center of cut.

When more than two geometrically regular contours are involved, the procedure is the same. Cutting centers of any two of the contours are joined by a straight line and the composite cutting center is determined. This center is joined by a straight line to the center of one of the other shapes and a new composite center is found. This is continued until all of the punches have been included.

Unfortunately, blanks are seldom composed of geometrically regular figures. In most cases the cutting center must be determined. Mathematical and graphical methods are used to determine cutting centers of irregular figures.

The methematical method consists of drawing two arbitrary coordinates parallel to the greatest possible number of sides of the blank shape. The cutting contour is sectioned into straight lines and circular arcs, and the cutting center for each component is determined. The horizontal distance between the *Y* axis and the center of a component is multiplied by the length of the component for each cutting section. When the sum of these products is divided by the perimeter, the resultant is the distance between the *Y* axis and the effective cutting center. The same procedure, but with vertical distances from the *X* axis, complete location of the cutting center.

In a practical example, *Fig* 3, the sum of products for horizontal distances is 1.928 and the sum of products for vertical distances is 1.324. Dividing each of these by the perimeter, 3.16, results in coordinates for the effective cutting center of $x_c = 0.61$ and $y_c = 0.419$.

The graphical method is based on the polygon of forces. Since the resultant of coplaner forces corresponds to the algebraic sum of the single component forces, the point of application of the resultant lies at the intersection of the extreme vectors of the polygon of forces.

The complete process can best be illustrated by an example. The blanking outline, *Fig.* 4, is divided into sections, the cutting center of each being easily determined. A vertical line is dropped from each cutting center. A vertical line, *AB*, is drawn to the side of the punch drawing and it is subdivided in

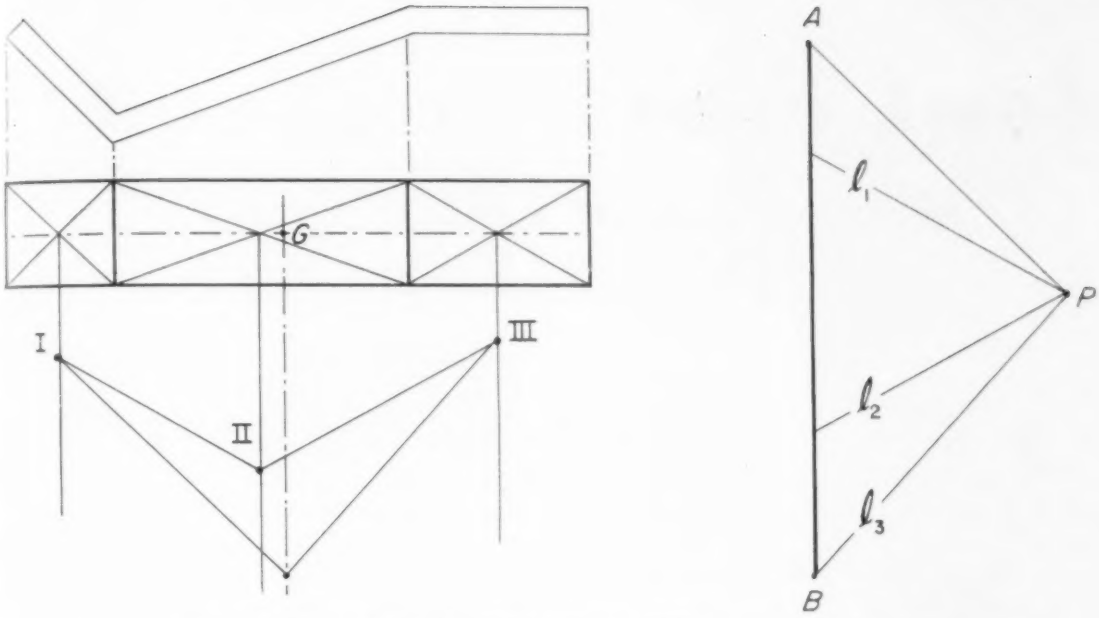


Fig. 6. Graphical methods, using projected areas instead of perimeters, can be applied to the determination of the pressure center in forming operations.

proportion to the lengths of the sections. The order of subdivision follows the order of the vertical lines to the section centers, left to right or vice versa.

An arbitrary point, *P*, is established so that it is about half the length of *AB* from *AB* and about opposite the midpoint. Lines l_1, l_2, l_3, etc. are drawn to connect point *P* and the ends of sections of *AB*. From an arbitrary point, I, on the left-hand vertical dropped from the blanking outline, a line is drawn parallel to *AP* and another is drawn parallel to l_1. The latter line intersects the second vertical. From this intersection, a line is drawn parallel to l_2 to intersect the third vertical. In a similar manner, parallels are drawn to the other auxiliary lines. From point V on the right-hand vertical, a line is drawn parallel to l_5 which intersects the first line drawn from I. This intersection is directly beneath the center of cut of the punch.

The vertical location of the center of cut is determined in the same way. From point *A*, a horizontal line is extended to *N*. This is broken in the same way as *AB*. Lines from VI, parallel to *AP*, and from X, parallel to l_{10}, intersect at a point that indicates the vertical position of the center of cut.

The effective cutting center of multiple punches can be determined in the same graphical way, *Fig.* 5. This particular example also indicates how circles can be included in the graphical solution. For trimming punches, only those portions that will actually cut should be included in the computation.

Determination of the location of the shank axis for bending and forming dies is similar to that for cutting dies. In order to obtain satisfactory operation without side strains in forming dies, the shank must be located at the center of pressure. However, pressure is not restricted to the perimeter, as in cutting dies, but is uniformly distributed over the entire blank surface. The center of pressure is determined from the horizontal projections of each surface portion into which the finished part can be subdivided. The graphical method for determining the pressure center of a forming die is illustrated in *Fig.* 6.

Mathematical and graphical methods can be used for combination dies where blanks are simultaneously pierced, blanked and formed. Proper factors and corresponding specific force requirements are taken into account for each type of operation.

For dies with shear on the punches or dies with several punches that enter the stock successively, determination of the cutting center is somewhat different. For best results, the shank axis should be placed at the mean cutting center determined from the individual centers in existence as each punch enters the stock.

It is not always possible to locate the shank in the theoretically correct position. Sometimes it is necessary to take into account existing holes in the press table for disposal of blanks and slugs, available space for mounting the die and, in special instances, the limited possibilities for location of spring-actuated ejector devices. In such instances, some alternative should be devised such as successive cutting, shifting the cutting center or avoiding the need for a shank by fastening the punch directly to the press ram. The latter alternative makes the best of a bad situation because the bending moment is considerably lessened.

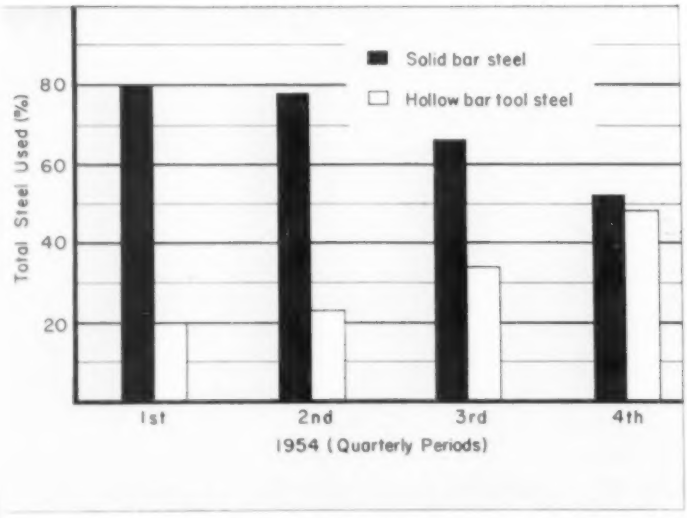
tool costs reduced

through use of hollow stock

USE OF GRAPHITIC hollow-bar tool steel for making dies and gages has resulted in substantial economies at The Timken Roller Bearing Co. The stock is rough turned on the outside diameter and bored on the inside, in sizes ranging from four to 16 inches OD with various inside diameters. Lengths range from six to ten feet.

Table 1—Cost Comparison of Toolmaking with Conventional vs. Hollow Bar Stock

Type of Tool Produced	Labor Cost Solid Bar Stock ($)	Labor Cost Hollow Bar Stock ($)	Savings ($)	Savings (%)
ID Size & Taper Master	1.90	1.40	0.50	26
Closing-in Die	3.72	2.43	1.29	35
Mult. Wing & Spread Die	2.63	1.54	1.09	42
Mult. Perf. Die	2.65	1.70	0.95	36
M. P. Die Top Insert	0.77	0.64	0.13	17
Finish Master Cup	2.32	2.21	0.11	5
Ring Master	2.22	1.59	0.63	28
Pressure Ring	2.55	2.33	0.22	9
Blanker Die	3.77	2.60	1.17	31
Cone Work Cup	3.63	3.35	0.28	8
Savings	26.16	19.79	6.37	24



Growth in use of hollow bar tool steel at The Timken Roller Bearing Co. compared with solid bar stock.

Solid bar stock and forgings were formerly used in the company's toolroom for dies and gages. Many drilling and turning operations on solid bars for dies and other purposes are eliminated by substituting the prebored stock. Toolroom supervisors have found that graphitic tool steel machines approximately thirty percent faster than other tool steels due to free graphite in the steel's microstructure. Wearing qualities of tools made of this material are excellent.

On a representative group of ten machining jobs ranging from machining of a master gage to the machining of a multiple perforating die, average savings in labor costs were 24 percent when hollow bar graphitic tool steel was used, as indicated in the accompanying table. Time and money saved on some machining jobs were as much as 50 percent. During the year 1954, the company's use of solid bar stock for dies and gages decreased by 28 percent while the use of hollow bar tool steel increased by the same amount. Rapid growth in use of the new material is shown in the accompanying chart. Savings in excess of $56,000 were made by the toolroom alone by using hollow bar tool steel rather than solid stock wherever possible.

Other savings result from less wear and tear on machinery, reduced inventory of drills and faster delivery of graphitic hollow bar tool steel as compared with forgings.

The successful accomplishment of an effective cost reduction by using graphitic hollow bar tool steel can be made by specification of the proper sized section to a given job. The smaller amount of stock to be removed will provide a substantial saving of machining time. Where a choice must be made on the stock size of graphitic tool steel to be specified, the inside diameter should be favored. Stock removal from the outside diameter is, in most cases, more economical than stock removal from the inside diameter.

work sampling

gives better time study allowances

By B. W. Niebel
Associate Professor
Dept. of Industrial Engineering
Pennsylvania State University
University Park, Pa.

TIME STANDARDS are widely accepted as a necessary management tool for profitable production operations. Work measurement, utilizing the stop watch, is conceded to be the most effective way for determining a time standard that is equitable to both labor and management.

Perhaps the weakest link of the whole time study process is the method frequently employed in determining an allowance to add to the normal production time in order to secure the total allowed time for an operation. Usually such a procedure consists of accurately measuring to one hundredth of a minute the time required to perform each element of a job.

After this is done the data are subjected to statistical analysis, followed by an intricate performance rating. This procedure seems appropriate when the importance of the end results is considered. If, however, after carefully going through this exhaustive series of steps, an allowance is arbitrarily added to accommodate personal time, unavoidable delays and fatigue, the whole procedure appears to produce a study of dubious accuracy.

The difficulty and cost of determining fair allowances have long been recognized. Time study analysts detest the taking of the all-day study as do operators subjected to this technique, which is used in determining allowances. True allowances, so essential in arriving at fair standards, can take years to evolve when computed with the stop watch and the all-day study.

As a result of this, there has been a tendency, in order to save time and money, to estimate by subjective techniques what appears to be a fair allowance and add this to the normal time to arrive at the task time. The result of this procedure can mean in the long run only one thing—an unsatisfactory rate structure with resulting complications in labor relations.

Work Sampling is a technique that has allowed the industrial engineer to more accurately estimate time study allowances at a fraction of the time and cost required for the all-day stop watch study. In the work sampling method, a large number of observations of different operators of a given class of work are taken at random intervals. Then the percentage of the occurrences in which the operators are being delayed for miscellaneous reasons will tend to equal the percentage delay allowance that should be permitted, *Fig.* 1.

No watch is used, a fact that makes the procedure especially palatable to the operator. The analyst merely records on a form the exact state

that the operator is in when he makes his observation.

So it can readily be seen that it is possible for the analyst to observe a whole battery of facilities and make his recordings in a matter of less than a minute. He then returns to his office and proceeds with other work until it is time for his next random observation.

The success of work sampling is based on:

1. The number of observations
2. The time when the observations were taken.

The larger the number of observations taken, the more valid the results. Usually 1500 observations or more will give reliable values. It is also essential that the observations be taken over a reasonably long period of time, usually two weeks, and that they be made during random intervals.

One method that may be used to determine the exact time that observations should be taken is to daily select numbers from a statistical table of random numbers. Then let each number carry an equivalent value in minutes that can represent the time from the beginning of the workday for which an observation is to be taken.

As has been mentioned, sampling errors will diminish as the size of the sample increases. By knowing the allowable standard error permitted and by approximating the percentage occurrence of the element being sought, it is possible to determine the number of observations needed as follows:

$$N = \frac{p(1-p)}{S^2}$$

where

N = total number of random observations upon which p is based

p = percentage occurrence of the element being sought expressed as a decimal

S = the standard error

For example it might be anticipated that unavoidable and personal delays (p) total 10 percent of the working day and a 95 percent certainty that the allowance figure is within ± 10 percent of this estimate is desirable. The 95 percent confidence limit establishes value of the standard error at ± 1 percent.

Thus in this case 2 S would equal 1 percent and 1 S would be equal to 0.005. The number of observations required to establish accuracy of the assumption is:

$$N = \frac{0.10(1-0.10)}{(0.005)^2}$$

$$= 3600 \text{ observations}$$

From this discussion it is evident that work sampling is another tool available to the industrial engineer, which facilitates establishment of equitable standards of production.

Fig. 1. Summary chart of interruptions on various classes of work.

PLANT 26 — SYLVANIA ELECTRIC PRODUCTS, INC.

DEPT. 4 — SUMMARY SHEET (RATIO DELAY) — DATE 4/22/55

NUMBER OF OBSERVATIONS

OPERATION	ENGINEER	SUPPLY	QUALITY	MACHINE	SUPERVISION	TURNING ON LIGHT	MISC.	WORKING	TOTAL	NO. OF INTERFERENCES	PERCENT ALLOWANCE	MIN. PER DAY
BENCH	1	11	1	0	12	1	119	2750	2895	26	0.898%	4.13
BENCH MACHINE	0	2	0	0	5	0	69	984	1060	7	0.661%	3.04
MACHINE	0	1	6	11	9	0	29	1172	1228	27	2.20%	10.12
SPRAY	0	0	0	7	36	0	262	1404	1712	43	2.51%	11.55

REMARKS: Summary Sheet for Interference allowances. See observation sheet for details of miscellaneous.

NOTE: All observations are to be taken at random

*From *Motion and Time Study* by B. W. Niebel

automatic hot-test stands

symbolize progress at Plymouth engine plant

By Robert A. Wason
Associate Editor

Because it is easier to study a single detail than an entire master plan, one major phase of the newly tooled engine plant will be described. Effectiveness of strong management and engineering decisions, teamwork, spirit and vision is amply illustrated.

To have finished V-8 automobile engines flowing off a run-in test stand within 17 months after the engine design was started, required exceptional engineering in action. Yet, that was the schedule set up and met by Plymouth Div., Chrysler Corp. To meet such a schedule, it was necessary to innovate, cut corners and blaze new trails. For example, Plymouth personnel requested run-in test stands on which all engine connections would be made automatically. This had never been accomplished before and the young men of Plymouth asked for it only because they saw it as the way to do the job and because they didn't know all the reasons why it couldn't be done.

Following the request and preceding the hot test of the first engine is a story long on technical detail but short in time. Plymouth wanted flexibility in design, layout and operation. They reasoned that automatic operations offered the key to flexibility when such mechanization could be economically proved. A positive approach was made: plan to mechanize operations until it is proved that automatic operation is infeasible.

As more and more operations are mechanized, machine control should be integrated. Information

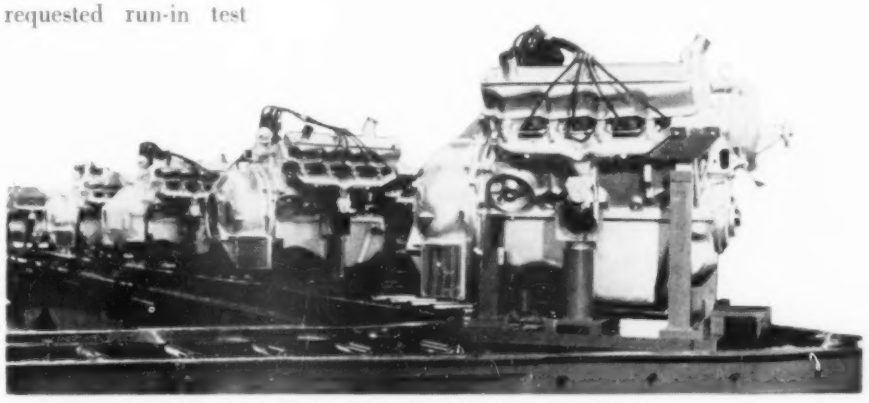
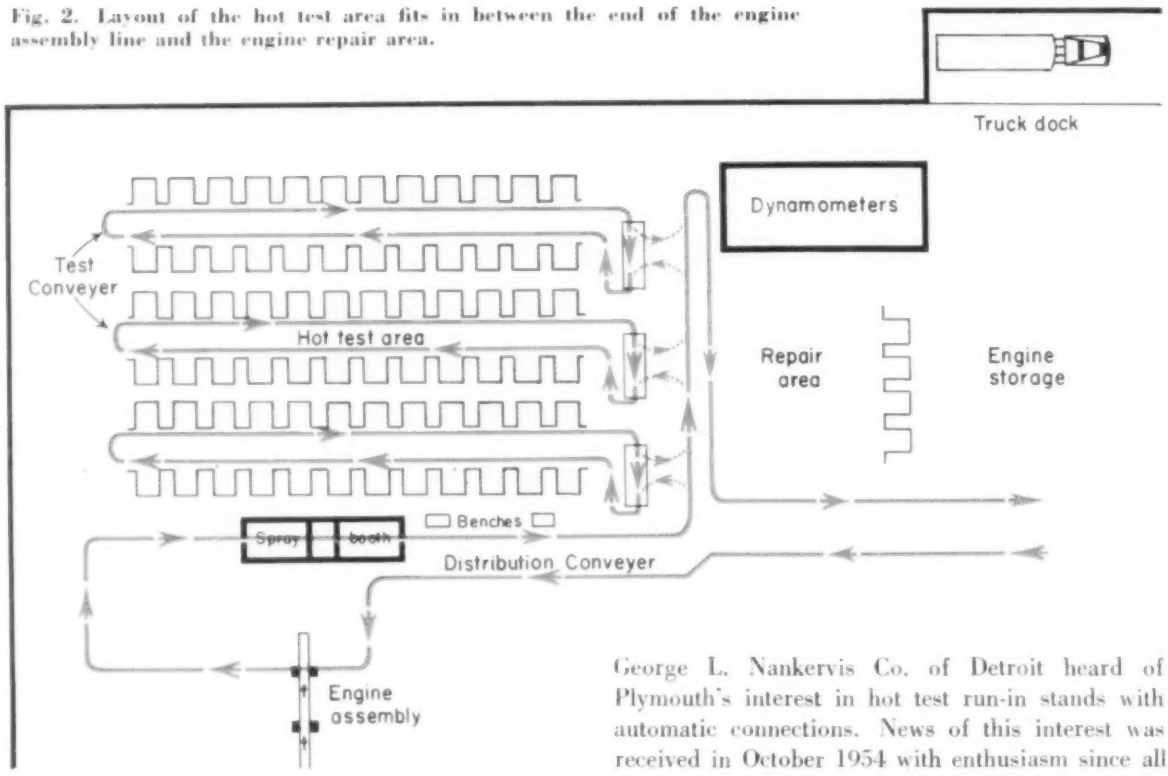


Fig. 1. After completion of a 20-minute run-in test, engines continue the trip around the test conveyor loop and are removed from the pallet.

Fig. 2. Layout of the hot test area fits in between the end of the engine assembly line and the engine repair area.



has to be transmitted forward and backward along production lines to maintain smooth production flow. Visions of attempting to tie controls together on equipment supplied by many companies led Plymouth to try a new approach. Responsibility and authority for large production segments were subcontracted to individual companies. These companies then had to organize, design, buy, build and install all the equipment required in their own segments. There was no division of responsibility or authority among several companies in a particular area and Plymouth personnel was left free to contemplate progress in all areas. Had Plymouth acted as contractor for the entire plant, viewpoint of operations as a whole might have been crowded out by necessary technical detail.

Plans of all companies involved had to embrace a major production philosophy. Plymouth wanted to produce a standard engine with a minimum amount of scheduling. Where model differences might occur, such as in the use of two or four-barrel carburetors, equipment should accept either type. The basic Plymouth V-8 engine can be altered, by the accessories associated with it, for use in passenger cars, light trucks and taxicabs, and to meet export market needs. However, engines need not be scheduled for such end use during primary production phases.

Having supplied test equipment to various Chrysler Corp. divisions for a number of years, the George L. Nankervis Co. of Detroit heard of Plymouth's interest in hot test run-in stands with automatic connections. News of this interest was received in October 1954 with enthusiasm since all previous test equipment had required manual connection of service lines to each engine. Here was an opportunity to introduce an automatic test system to keep pace with highly automated production lines.

Plymouth let it be known that there could be no long development program and pilot models could not be built since time was limited. Therefore, at the expense of routine business and home life, Nankervis engineers came up with a workable concept in one week. This was late in December 1954. The concept presented to Plymouth far surpassed the original specifications for automatic connection of the engine services. Plymouth immediately recognized the system to be simple and entirely feasible even though details had not yet been filled in to make a complete plan.

The system, as proposed by Nankervis, consisted of individual test stands, each an operating entity but tied together in a system by a single conveyor which would both deliver and take away engines from the stands. For convenience and practicability, it was proposed to have three separate systems, each consisting of 24 stands.

Based on this concept, Plymouth requested a formal proposal. Again the youth and speed of decision of the Plymouth team was evidenced. Proposal drawings were completed on January 5, 1955, the proposal was forwarded on January 7 and a purchase order dated January 12 was awarded. Details of designing equipment and proving the concept were left to Nankervis, as was the responsi-

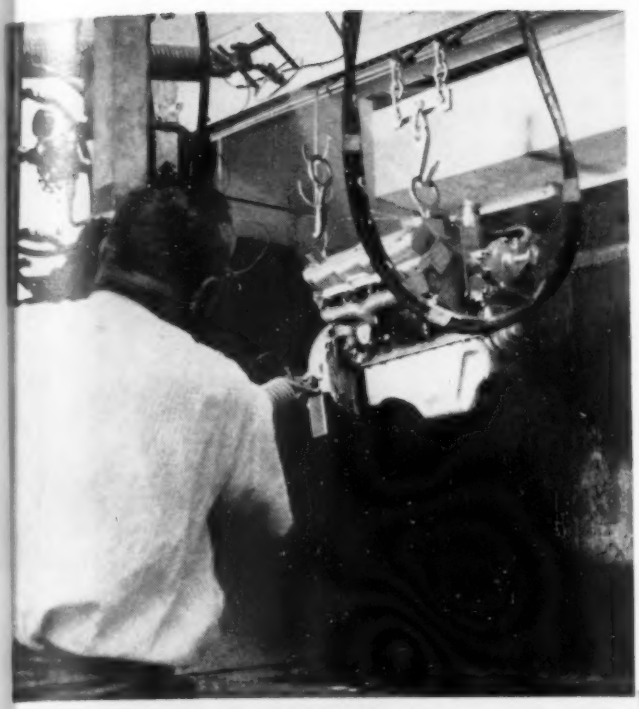


Fig. 3. Three electrostatic paint spray guns apply paint to one side of the engine against a waterfall wall. Three more guns coat the other side of the engine in the other half of the spray booth.

bility for installing all equipment necessary for operation of the system.

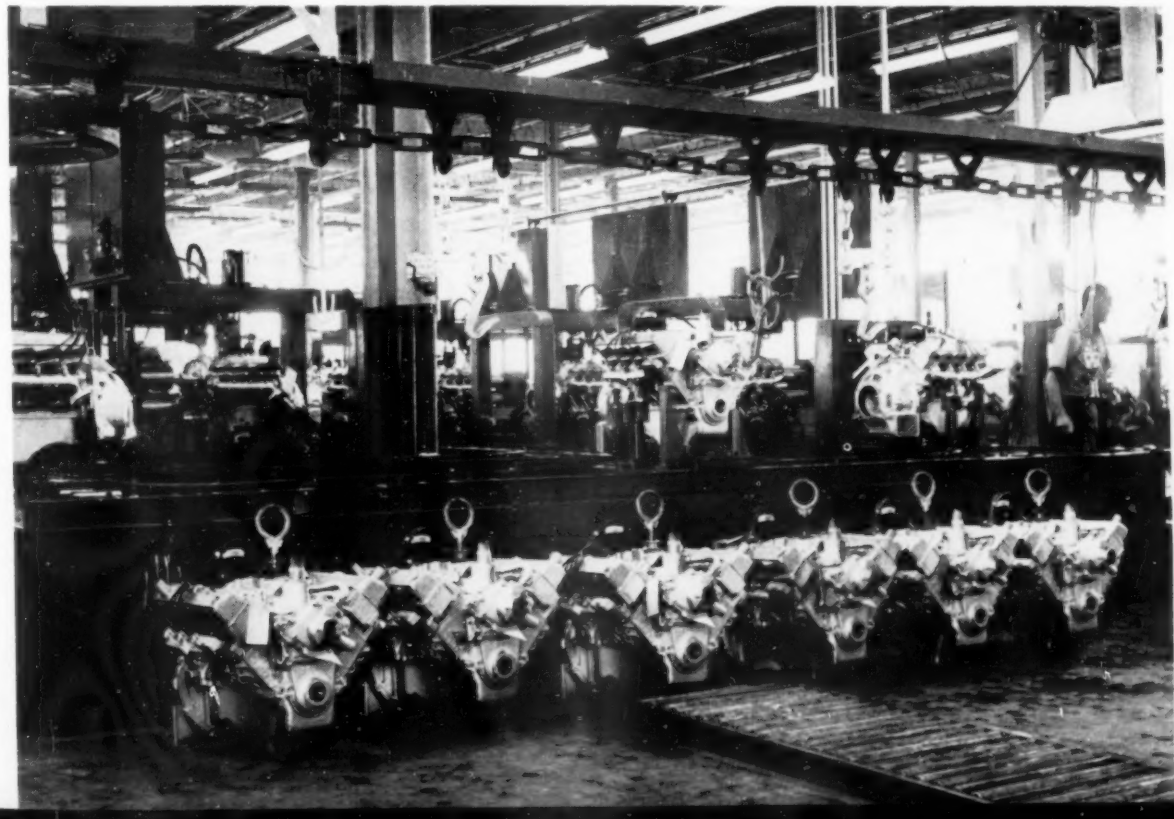
From the end of the engine assembly line, *Fig.* 2, a distribution conveyor carries engines to a prepaint area. Here, a set of hole covers, looking much like scaled-down milk-can covers complete with handles, is removed from a special hook on the conveyor and manually placed over the engine openings. The distribution conveyor continues through an electrostatic paint spray booth, *Fig.* 3, where six guns, three from each side, apply an even coat of aluminum paint.

The spray booth functioned perfectly but introduced an unlooked-for hazard. With the Scientific Electric equipment used, paint is charged at the gun. To prevent the charge from working back through the metallic pigment to metal piping, polyethylene tubing served to deliver paint and also to insulate the system.

Operation was satisfactory but the 150 high flash VMP naphtha vehicle in the paint ate through the polyethylene in about three weeks. Replacement tubing lasted no longer. Because of the possibility for flash fires, this condition could not be allowed to continue. Solution of the problem was simple. Paint lines were rearranged and a liner, not affected by the vehicle, was inserted between the paint and the polyethylene insulator.

Incidentally, there is no paint-mixing room in this plant. Paint is purchased mixed in drums and used with a drumhead unit that includes a pump and an agitator. Consequently, there is minimum equipment to be maintained and no large concen-

Fig. 4. The distribution conveyor, top, brings green engines to the test area and removes tested engines to the storage area. Engines are transferred between conveyors by a small hoist running on a short track. Engines in foreground are waiting to be rolled across the aisle to the repair area for adjustment.



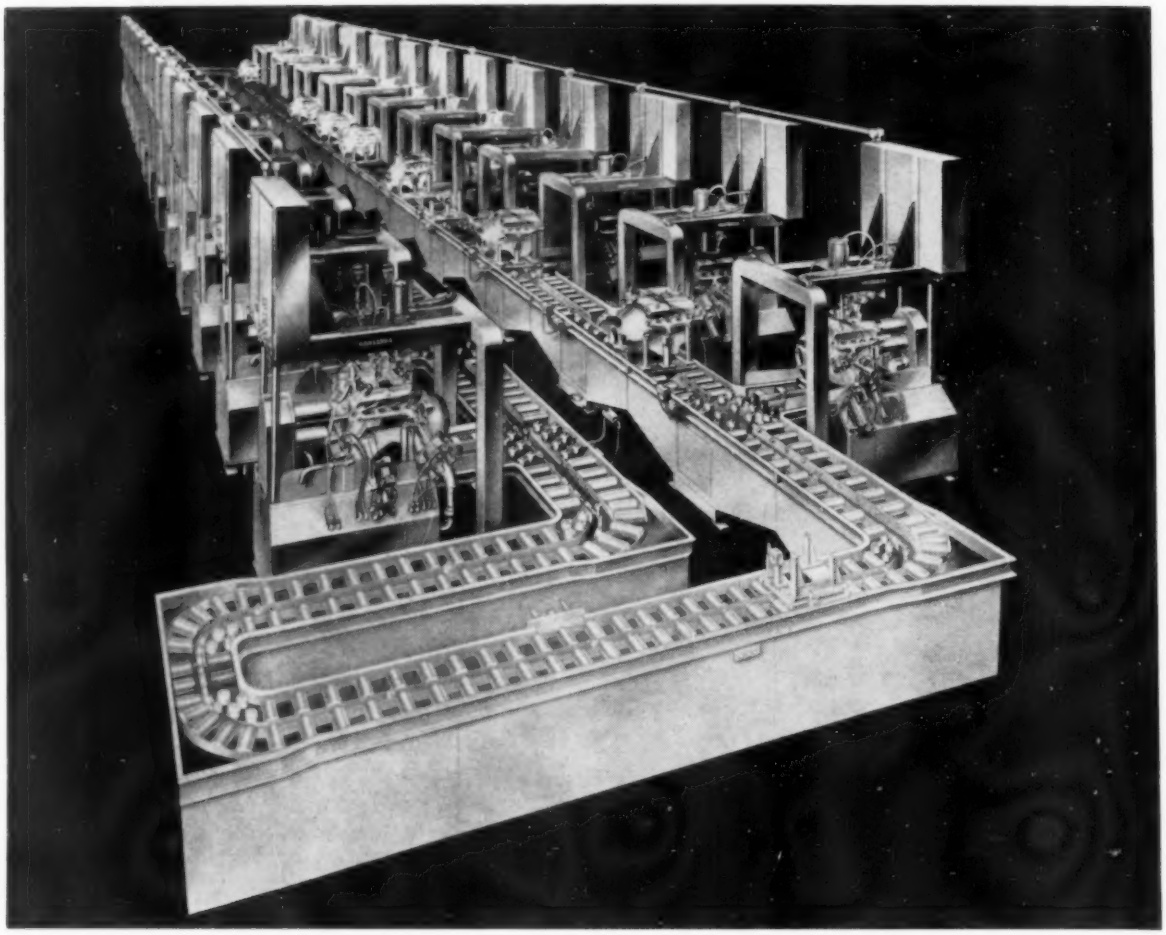


Fig. 5. View of the hot test area showing some of the identical test stands that combine to form three separate loops.

trations of paint to create hazards in the plant.

As the engine leaves the spray booth, the masking covers are manually removed and replaced on the special conveyor hook. Masks are permanently stored on the conveyor and cycle with it. After the masks are removed, the coil, distributor and plug wires are added to the engine.

Engines are conveyed to a load-unload area, *Fig.* 4, where the distribution conveyor parallels three test conveyors. Every third green engine is removed from the distribution conveyor and placed on a pallet on the first test conveyor. Since tested engines are placed on the distribution conveyor at the first station, every second green engine is removed from the distribution conveyor at the second test conveyor and all the remaining green engines go to the third test conveyor.

The green engine is placed on a pallet that will be transferred by a pin. The pallet is conveyed past the test stands, 24 of which are included in each loop, *Fig.* 5. When the pallet approaches an operable but empty test stand, switches are automatically set up to transfer the engine and pallet into the stand. Upon completion of the run-in test, the test stand waits for the approach of an empty pin. When conditions are right, the tested engine is ejected from the stand to the conveyor, which carries it along to the unloading station. If the engine is tagged as having passed the run-in test, it is manually transferred by hoist to the distribution conveyor and carried to engine storage.

Objective of the carrier pin system is to combine a loading and unloading conveyor in one system. This allows segregation of green engines from tested engines at the same station while on the same conveyor. Segregation is accomplished by two types of pins, *A* and *B*, which alternate on the conveyor. The *A* pins handle only green engines and *B* pins handle only tested engines.

Smooth operation at the load-unload station assures smooth operations in the test area. After the empty test conveyor has been started, the operator removes the first green engine from the distribution conveyor and places it on a pallet on an *A* pin. The system is designed so that at any time the test conveyor is emptied, most of the pallets will be on

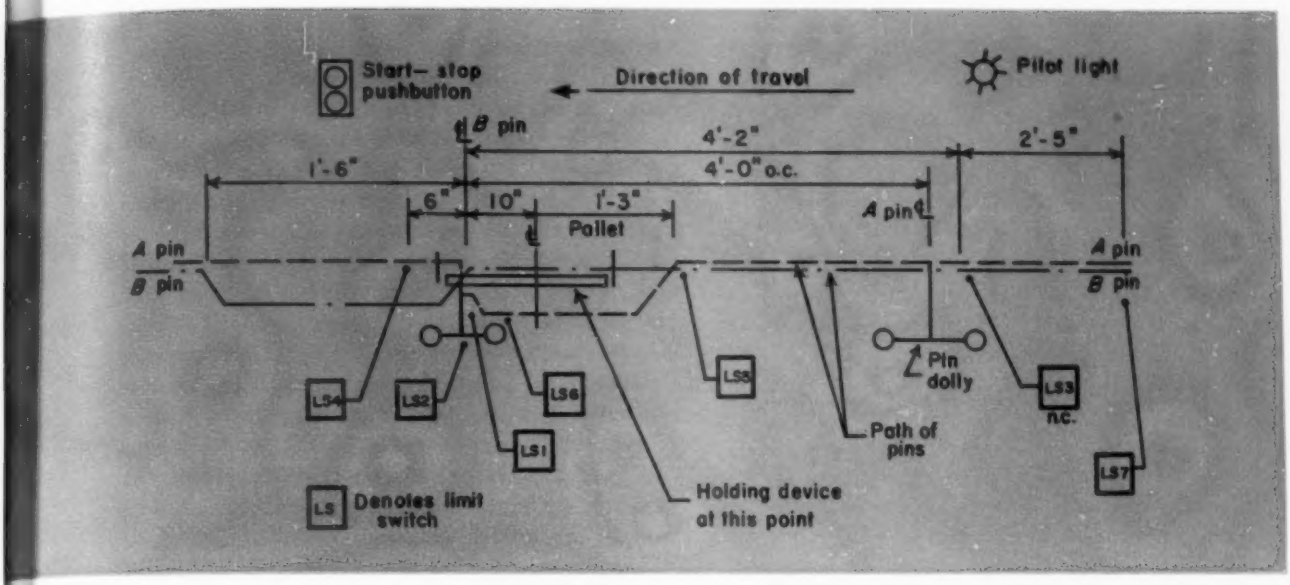


Fig. 6. Automatic limit switches at the load-unload station control the forward progress of pallets. Paths of *A* and *B* pins indicate how a pallet is dropped by a *B* pin and picked up by an *A* pin.

A pins. The operator loads the pallet that hesitates at the loading station because such a pallet will be picked up by an *A* pin. Once the test conveyor is loaded, it is not stopped during normal conditions.

As run-in tests are completed, a pallet on a *B* pin with a tested engine, followed by an empty *A* pin, approaches the unloading station. A pilot light, which stays lit for about one minute, signals the approach of a loaded *B* pin. The operator manually transfers the engine to the distribution conveyor while the pallet is moving and before it reaches the loading station.

While the operator is transferring the tested engine to the overhead distribution conveyor, the pallet moves on to the load station where the *B* pin is retracted and the pallet held stationary for loading. Controls used at the load-unload station are shown in *Fig.* 6. When LS7 is tripped by a *B* pin,

Fig. 7. Each test stand includes a unit of the test conveyor so that stands can be added to or taken from the loops. Stands include all the controls necessary to move engines off of and onto the conveyor. Panel lamps indicate the stand condition.

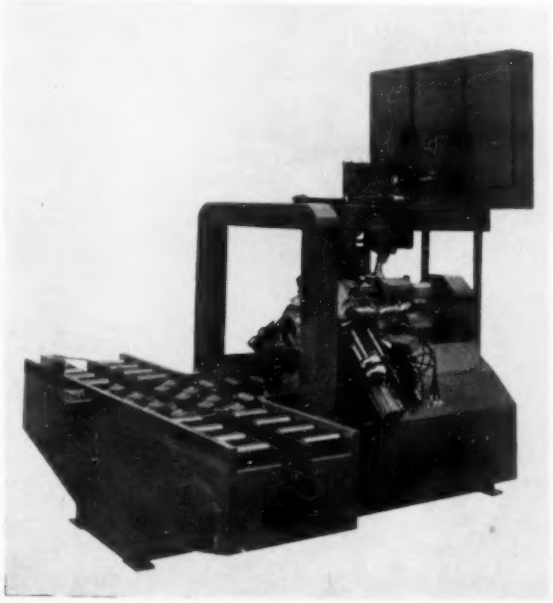
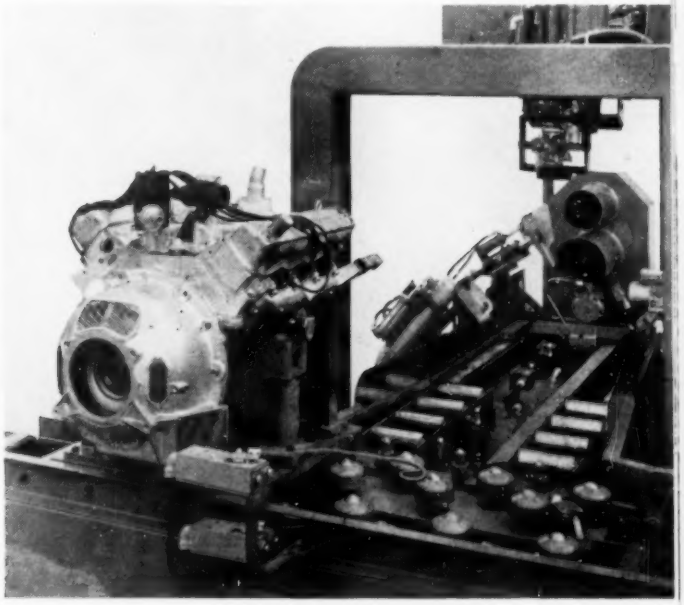


Fig. 8. Limit switches of an empty test stand are set to actuate various connections when an engine is in test position. Rubber drive for the water pump and the crank starter are in a unit at the back of the test stand.



the pilot light is energized. Whenever LS1 is tripped by a pallet and LS2 is tripped by a *B* pin, the *B* pin is retracted. If LS3, normally closed, is not actuated, tripping can be accomplished by the *B* pin.

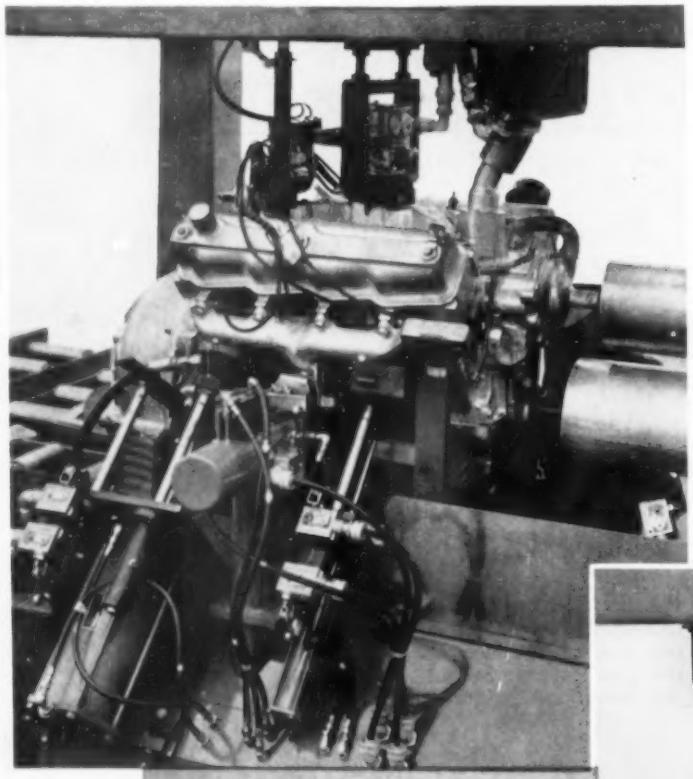
Tripping of LS2, in addition to lowering the pin, actuates the pallet holding mechanism. At a point behind the stopped pallet, the *A* pin actuates LS5 and is retracted. LS6, tripped by *A* pin release, retracts the holding mechanism. The pallet must then go to the test stands, whether an engine has been loaded on it or not. Test stands sense, by an arm-actuated limit switch, whether or not there is an engine on the pallet and will not accept an unloaded pallet from an *A* pin.

If more than six test stands are out of operation, it is possible for a pallet and engine on a *B* pin to be followed by an *A* pin with a loaded pallet as it approaches the unloading station. The tested engine should be transferred to the overhead distribution conveyor. If the tested engine is not unloaded, the pallet and engine remain on the *B* pin and recycle the test loop. This engine will not be transferred into an open test stand because the stand accepts engines only from *A* pins. Also, the test stands will not eject a tested engine to this *B* pin because such transfers can only be made to empty *B* pins.

Since the conveyor system and the test loops were designed to have a load factor of 80 percent, the condition of six inoperable test stands at one time should not occur frequently.

Seventy-six identical test stands, *Fig.* 7, four of which are located in the repair area, comprise the hot test setup. These stands are supplied with every service from central supply units. All facilities, except electrical, are brought to the stand and emerge from the floor underneath the stand. Each stand is independent of the rest of the stands because shutoff valves for each service are located at the floor level, where hose connections to the stand are made.

A main electrical panel for each of the three test loops controls the exhaust and ventilation fans, as well as the conveyor drive. These panels also con-



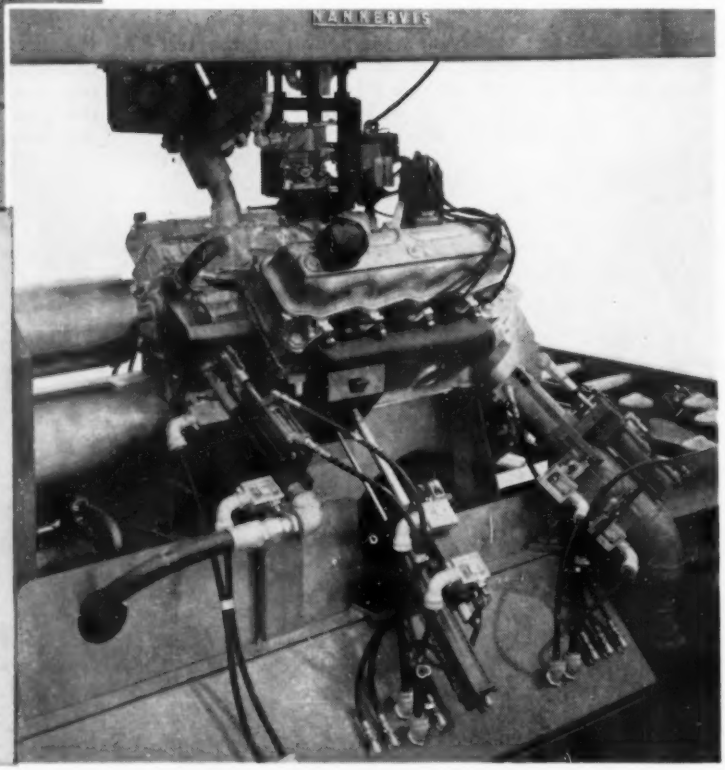


Fig. 9. (above) Close-up of an engine in test position showing top and right-hand connections and their actuating cylinders.

Fig. 10 (right) View of the left-hand connection clearly shows the limit switches that indicate proper matching of the connections.

trol the supply of power for the stands. Should material handling problems stop one section, only one-third of the production testing will be affected. Stand-by equipment for the service facilities assures constant supply of the production testing services.

Hot water is supplied to the engine during run-in. Fuel for the engine is natural gas because it permits safe handling and economy, and reduces fire hazards. The fuel is supplied via central piping. In addition to connections with the exhaust system, a ventilating system, which is part of the test stand, draws escaping fumes through duct work and out of the test area. Splashing oil and water are carried out by a process waste system.

A test loop can only be put into operation after both the oil and the air systems are turned on and reach predetermined levels at the test stands. Ventilation and exhaust fans are started at the main control board for the loop before any power can be applied to individual test stands. The conveyor drive is then started to begin engine transferring operations.

Each stand must be turned on individually to begin the testing of engines that were left in the stands at the time of shutdown. Those test stands that are empty will automatically begin their testing program. Stands with engines left at any phase of the running cycle have to be started manually because the program timer has already passed the automatic clamping and starting position.

The same pressure switches in the air and oil systems, which prevent current from being supplied to the stands until pressures reach preset levels, protect equipment from self destruction should transfer oil pressure or actuating air pressure fail.

When an engine approaches an empty stand, *Fig.*

Fig. 12. Tested engines are unloaded from the distribution conveyor and placed in racks that can be stacked.

Fig. 11. When a pilot light is energized, an inspector goes to the running engine, checks the oil pressure and visually inspects for leaks.

8, it and its pallet are pulled off the testing conveyor. When pulled all the way into the stand in the test position, against stops and the cranking adapter, service connections automatically start. Air cylinders move the ignition mechanism, carburetor and water out connectors down onto the engine, *Fig.* 9. Oil in and out, water in, exhaust out and normal water out plugs are then automatically applied, *Fig.* 10.

When all connections are made and sealed, as indicated by limit switches, the timer starts, engine oil flush begins and all services turn on. If all seals are not made, the timer does not start and the engine sits idle. If oil or water pressure is too low, the engine will not start, the timer does not start and a pilot light indicates which service has necessitated the shutdown.

When oil and water pressures are at acceptable levels, the engine is slow cranked for 10 seconds to complete the connection with the engine key. Cranking is stopped for 10 seconds to allow the socket to become fully engaged. The fast-crank air motor then operates for 10 seconds. When the engine starts, the cranking device is automatically released by action of a speed sensing device. If the engine does not start during the fast crank, a pilot light is illuminated and the timer stops. Through individual stand controls, an inspector can try to start the engine. If, after several adjustments are tried, the motor still does not start, the inspector can eject it, tagged for the repair area, to the testing conveyor.

Under normal conditions, the engine starts during the oil flushing cycle and runs for 18 minutes. At that time, flushing stops and filling begins. At the end of the $3\frac{1}{4}$-minute fill step, the engine will be running on its own oil pump and oil pressure will be indicated on a gage for the inspector. If the oil pressure exceeds the pressure switch setting of 35 psi, the engine will continue to run. When the engine is filled with oil, an inspection light is illuminated. The engine will continue to run until inspected and the inspector pushes the inspection release pushbutton. The timer then measures the last two minutes of operation. The tested engine can then be ejected automatically onto an empty *B* pin.

In addition to checking the operating oil pressure, the inspector visually inspects the engine, *Fig.* 11, for indications of abnormal operation. These can include noises and leaks. Each inspector has an individualized paper punch with which he indicates the condition of the engine on the tag attached to it. Just four punchmarks are required to show each engine as successfully tested.

If transfer of an engine into the test stand has not been completed before the following pin or pallet enters the transfer area, the testing conveyor will automatically stop to prevent a jam. A pilot light lights on the stand involved.

When a tested engine arrives at the unloading station, it is transferred back to the distribution conveyor for delivery to proper area. This distribution conveyor carries the good engines to storage area where they are unloaded, *Fig.* 12, onto racks. Each rack holds six engines and they can be stacked for storage, *Fig.* 13, and rail or truck shipment.

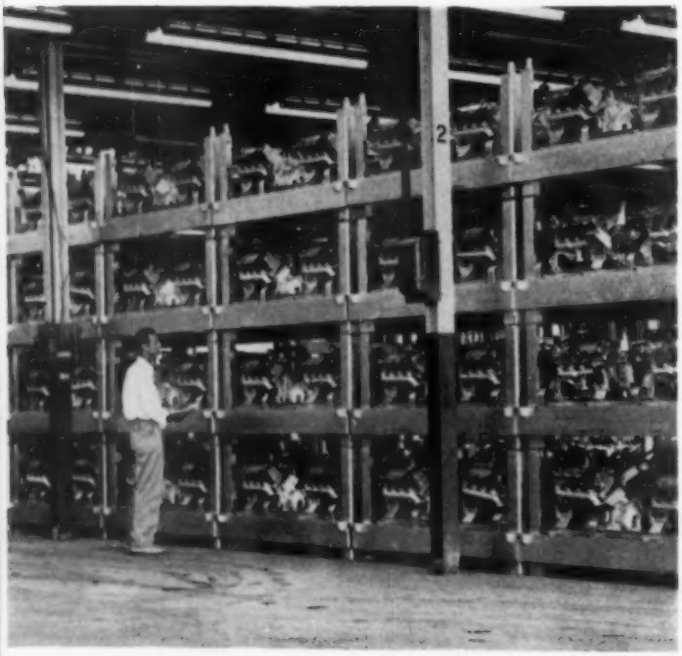
Several dynamometers are used to run load tests on engines selected at random. Tested engines are run to destruction, torn apart for inspection prior to destruction, etc. to insure maintenance of performance standards.

By building flexibility into production and using a maximum of automatic operations, Plymouth has satisfied its aim for a quality engine. This has been accomplished without reducing standards.

Since the Plymouth engine plant was to start with limited production and to increase to a rate of 3000 engines per day, hot test stands were scheduled for installation in units to meet production requirements. Most of them have been installed and the system has proved to be everything it was expected to be. This is ample proof that progress can be speeded when a production team understands the requirements of the operation but is not limited by knowing all the reasons why progress must be slow.

Acknowledgment: The author wishes to thank the Plymouth Div., Chrysler Corp., and the Geo. L. Nankervis Co. for their help in supplying both information and illustrations.

Fig. 13. Stacked racks of finished engines await shipment by truck or rail to assembly plants.



tempering chart

for steels used in tool engineering

BECAUSE VARIOUS TYPES OF STEELS used in tool engineering are heat treated differently and temper to different hardnesses, it is convenient to have a simple check list of methods and properties for those types frequently used. Since tool steels are usually procured by brand names, any practical list must include such names. This chart has been prepared as a starting point for such a check list. A representative group of brands used in various sections of the country are included. Inclusion or omission of a particular brand does not indicate recommendation or lack of recommendation. To increase the value of the chart, frequently used brands of similar analyses should be listed.

Data Courtesy **Lindberg Steel Treating Co., Chicago, Ill.**

1-2 Percent Si-Mn Chisel
(SAE and AISI Nos. S2 and S5)

602 Chisel
#4870
C. E. C.
Duredge
G. W. #280
La Belle #2
Lanark
M. S. N.
Magic
Omega
Plancher
Silman
Solar
Triton
Vanango

Tempering Temperature (F)	Hardness (R_C) 1% Si	Hardness (R_C) 2% Si
As quenched	61-63	
300	59-61	
350	58-60	
400	57-59	
450	56-59	
500	55-58	
600	54-57	
700	53-55	
800	50-52	
900	46-50	

Harden: 1525-1600 F, water quench
1625-1675 F, oil quench

Mn Air Hardening
(SAE and AISI Nos. A4 and A5)

Airloy
Airmo
B A 8
B F Airloy
U. C. A. 2-2
Vairloy
Vega

Tempering Temperature (F)	Hardness (R_C)
As quenched	63-64
300	61-63
350	61-62
400	60-61
500	58-59
600	55-57
700	54-55
800	52-53
900	50-52

Harden: 1450-1550 F, air quench

W Fast Finishing
(SAE and AISI No. F2)

Alloy Fin.
Atlas XXX
B. F. S.
Colonial #4
Double Spec.
E. S. A.
Fast Fin.
G. W. 350
Graphtung
K W
Penco #20
Pure Ore Fin.
Regal
Saturn

Tempering Temperature (F)	Hardness (R_C)
As quenched	66-68
300	64-66
350	63-65
400	63-65
450	61-63
500	61-62
600	59-61
700	55-56

Harden: 1400-1500 F, water quench

High-Speed Hardened From Top Temperature Double Temper

Tempering Temperature (F)	18-4-1 Hardness (R_C)	18-4-1 (50C) Hardness (R_C)	M2 Hardness (R_C)
As quenched	64-66	59-61	64-66
1000	64-65	57-59	....
1025	64-65	....	64-65
1050	64-66	56-58	64-66
1075	63-65	....	63-65
1100	62-64	56-57	62-64
1125	60-62	....	....
1150	59-61	....	59-61
1200	56-59	50-53	54-57

Stainless Steel
Types 403, 410 and 416

Four-Hour Draw (F)	Hardness (R_C)
As quenched	38-45
900	38-43
950	35-40
975	26-35
1000	25-34

Harden: 1750-1825 F air/oil quench

AISI—SAE Steels
Average Hardenability
(Surface 1-inch round, oil quench)

Tempering Temperature (F)	4130 Hardness (R_C)	4140 Hardness (R_C)	4340 Hardness (R_C)
As quenched	45-50	52-56	54-58
700	38-42	46-48	46-50
800	36-39	43-45	45-48
850	35-38	40-43	42-45
900	34-37	38-41	39-43
950	29-32	37-39	38-41
1000	28-31	35-38	37-39
1050	25-28	33-36	35-38
1100	23-27	31-34	34-37
1200	18-22	27-32	30-34

Stainless Steel
Type 420

Tempering Temperature (F)	Hardness (R_C)
As quenched	52-55
400	50-52
600	48-50
800	49-50
900	45-47
950	44-46
975	42-45
1000	40-42
1025	35-38

Harden: 1825-1850 F, air/oil quench

Stainless Steel
Type 440A, 0.60 C

Tempering Temperature (F)	Hardness (R_C)
As quenched	55-58
400	53-55
600	50-52
800	51-53
900	53-55
950	51-53
1000	46-50
1050	42-46
1100	37-40

Harden: 1850-1900 F, air/oil quench

Stainless Steel
Type 440C, 1.00 C

Tempering Temperature (F)	Hardness (R_C)
As quenched	59-61
400	56-58
600	54-56
800	56-58
900	56-58
950	53-55
1000	52-55
1050	46-48
1100	40-43

Harden: 1850-1900 F, air/oil quench

Hi Carbon Hi Chrome Oil

(SAE and AISI No. D3)

3C
Crocar
G.S.N.
HYCC
Hampden
Hi-Pro
Huron
Hypro 62
Lehigh-S
Neor
Superdie
Superior #1
Triple Die
Ultradie #1

Tempering Temperature (F)	Hardness (R_C)
As quenched	64-66
300	63-64
350	62-63
400	61-62
450	60-62
600	59-60
700	58-60
950	57-59
1000	56-57
1025	52-54
1050	50-53

Harden: 1750-1800 F, oil/air quench

Low Mn, Cr-W Oil

(SAE and AISI No. 01)

Amcoh
Arrow
Atlan
B. T. R.
Badger
Bowco N.S.
Col. #6
Dymal
Excelsior
G.W.—Oil
Invaro #1
K-46
Ketos
Kiski
Non-Shrink
Oil Temp
Saratoga
Swedoil
Teenax 46
True Form
Vulcan O.H.
Wando
Yellow Label

Tempering Temperature (F)	Hardness (R_C)
As quenched	64-65
300	63-64
350	62-63
375	61-62
400	59-61
450	58-59
500	57-58
600	55-56
700	51-53
800	48-50
900	46-47
1000	42-43

Harden: 1420-1475 F, oil quench

5% Chrome Air

(SAE and AISI No. A2)

#484
A-H-5
Airchrome
Aircool
Air Hard
Airpro
Airque
Airtrue
Airvan
C-Z-N
Cromoloy
Domore
E-Z-Die
Hardnair
Sagamore
Select B
Sparta
Vuldie
Windsor

Tempering Temperature (F)	Hardness (R_C)
As quenched	63-65
300	63-64
350	62-63
400	60-62
500	60-61
600	59-60
700	58-59
800	57-58
900	56-57
1000	54-56
1050	52-54
1100	50-52
1200	43-45

Harden: 1750-1800 F, air quench

Hi Carbon Hi Chrome Air

(SAE and AISI No. D2)

Airdie 150
Alidie
Atlan HCC
Atmodie
CNS
Carp #610
Cromovan
Dykrome
High Production
Hi-Run
Hypro 61
G.S.N. Spec.
Lehigh-H
PRK 33
Ohiodie
Olympic
Ontario
Superior #3
Ultradie #2
White Label

Tempering Temperature (F)	Hardness (R_C)
As quenched	63-64
300	62-63
350	61-63
400	60-62
450	60-61
500	59-60
650	58-59
950	58-60
1000	57-58
1025	56-57
1050	54-56
1100	48-52

Harden: 1800-1850 F, air quench

High Mn Oil

(SAE and AISI No. 02)

Deward
Invaro #2
Mangano
Non-Shrink
Paragon
Ry-Alloy
S.O.D.
Special H.M.
Special O.H.
Stentor

Tempering Temperature (F)	Hardness (R_C)
As quenched	64-65
300	63-64
350	62-63
375	61-62
400	60-61
450	59-60
500	58-59
550	56-58
600	55-56
700	51-53
800	47-49
1000	42-43

Harden: 1420-1470 F, oil quench

Carbon Tool Steel

(SAE and AISI No. W1)

#11
BXX
Blue Label
Carbon
Col. #14
Extra
GW Extra
Gray Label
Hyten B #5
Jamison Special
La Belle Extra
Lion
Orange Label
Pompton
Pure Ore Extra
Special A.S.V.
Standard

Tempering Temperature (F)	Hardness (R_C)
As quenched	67-68
300	64-65
350	63-64
400	61-62
450	60-61
500	59-60
550	57-58
600	53-55
700	50-52
800	46-48
900	40-42
1000	33-36

Harden: 1425-1450 F, water quench

9% Tungsten Hot Work

(SAE and AISI No. H21)

57 Hot Work
A-42
Atlas A
CLW
Calo Ferro
DC-66
D.N.V.
D.Y.O.
G.W.—310
Marvel
Mohawk
Peerless A
T-Alloy-A

Tempering Temperature (F)	Hardness (R_C)
As quenched	52-54
1000	52-55
1050	52-55
1100	49-52
1150	48-51
1175	47-50
1225	45-48
1250	39-43
1300	34-38

Harden: 2000-2200 F, air quench

5% Chrome Hot Work

(SAE and AISI Nos. H11-H12)

#883
C.M.W.
Chro-Mow
Cr-Mo-V
C.W.D.
DC-33
Dica B
Dy-Cast #1
Firedie
GW-99
H.W.D.
Hotform
Nudie
Potomac
Pressuredie #2
Shelldie
T.C.M.
Thermo A

Tempering Temperature (F)	Hardness (R_C)
As quenched	54-55
1000	54-56
1025	53-54
1050	51-52
1060	48-49
1075	47-48
1100	44-45
1125	42-43
1150	40-41
1175	38-39
1200	36-37

Harden: 1800-1900 F, air quench

Tungsten Chisel

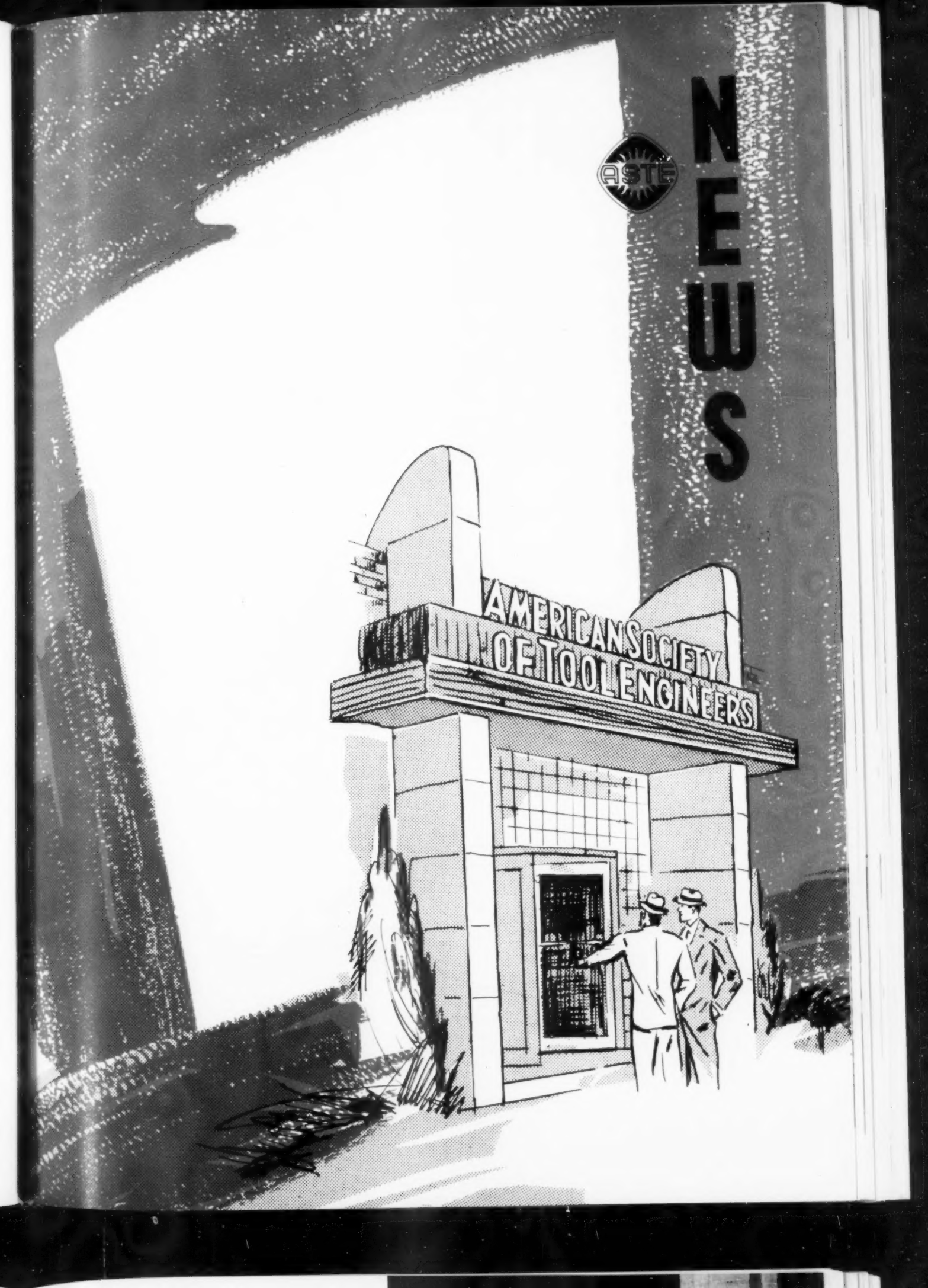
(SAE and AISI No. S1)

#67 Chisel
Atha Pneu
Brown Label
Buster
Excello
Hickory #7
J.S.
Par-X
Q.A.
Regin 711
Siminole
Special 18
Superalloy
Top Notch
Vibro
Woco

Tempering Temperature (F)	Hardness (R_C)
As quenched	58-61
300	58-61
400	57-60
500	56-59
600	56-58
700	54-56
800	52-54
900	50-53
1000	47-50
1100	44-46
1200	40-43

Harden: 1650-1750 F, oil quench

NEWS



featured this month

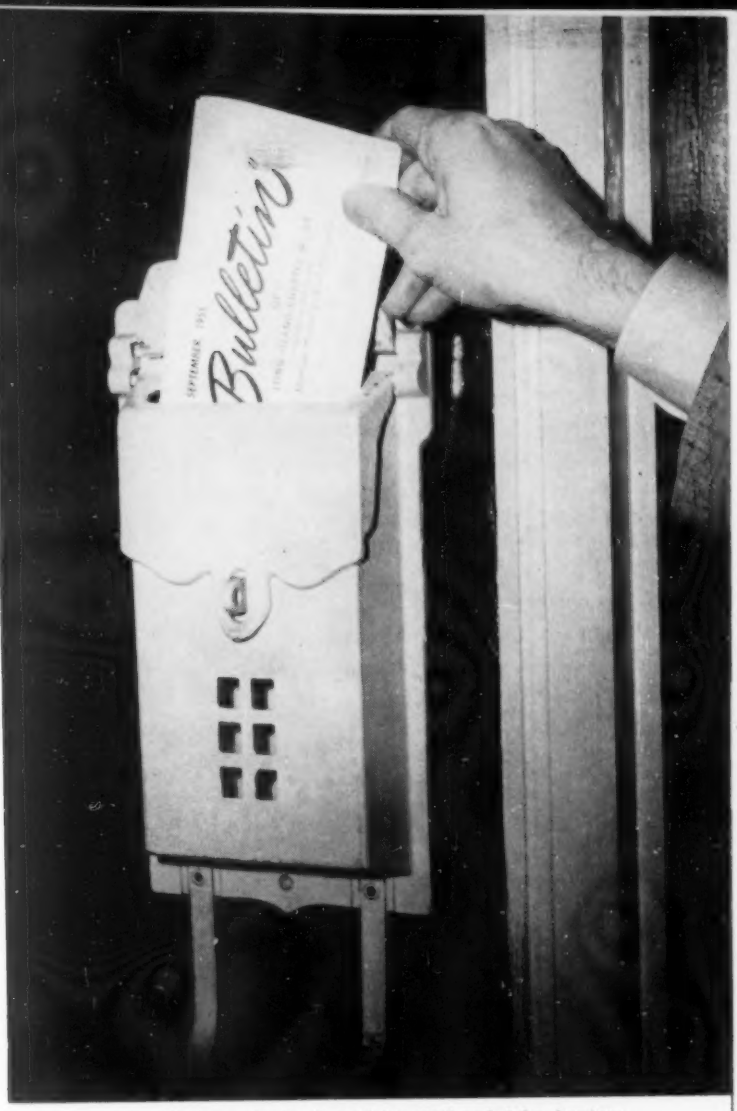
Operation Chapter Bulletin 129
Monmouth Chapter Chartered 134
The California Story 135
Exposition Stickers Ready 136
San Jose State College Conference 136
Semiannual Meeting 137
Ideas for Education Activities 137
Position Wanted, Positions Available 139
Indiana Council 143
Coming Meetings 144

chapter news

Baltimore 145
Battle Creek 145
Benton Harbor-St. Joseph 139
Binghamton 138
Boston 139
Chicago 140
Dayton 145
Decatur 144
Detroit 143
Erie 145
Evansville 145
Fond du Lac 140
Grand River Valley 138
Greater Lancaster 142
Hamilton Dist. 141
Houston 141
Indianapolis 142
Kalamazoo 140
Lansing 141
Lima 141
Little Rhody 141
London-St. Thomas 140
Long Beach 138
Long Island 120, 141
Los Angeles 138
Louis Joliet 140
Mid-Hudson 137, 145
Milwaukee 141
Monmouth 134
Montreal 143
Niagara Dist. 138
Northern Mass. 138
Northern New Jersey 139
Piedmont 140
Portland, Ore. 145
Racine 138
Rockford 137, 143
Saginaw Valley 141
San Antonio 142
San Fernando Valley 143
San Gabriel Valley 139
Springfield, Mass. 142
Toledo 139
Tucson 140, 141
Twin Cities 140
Western Michigan 145
Williamsport 139
Worcester 142

Operation Chapter Bulletin

By Edith R. Saunders
Assistant News Editor



Photographs by Russell Wygand and John Donlevy

Keeping in touch with members regularly and announcing the program for the next meeting is the all-important function of the chapter bulletin.

The term chapter bulletin probably produces as many different mental pictures to Society members as there are ASTE chapters. Autonomous operation of each chapter in local activities gives birth to all forms of chapter publications—from government post cards to 16-page color pamphlets on slick paper.

While the primary objective is to report the speaker, topic, date, place and time for that next meeting, quite a few chapter bulletins extend far beyond this point—"above and beyond the call of duty."

Best serving their chapters are the publications which reflect every possible phase of chapter activity—as well as presenting the personal touch in reporting news of members. The promotion of a "one big happy family feeling" unifies and strengthens a chapter.

Perhaps a page from the diary of the Long Island *Bulletin* might prove interesting to new chapters initiating a publication, or to chapters which have been planning to expand or improve present operations.

There is no ideal way to attack the many problems involved in publication because of individual circumstances of finance, spare time of members, facilities in the area, and so on.

Probably the most outstanding characteristic of the Long Island *Bulletin* is its "newsiness." Contents each month cover the waterfront of activities—including such items as personality sketches of active and interesting members, feature articles on local industry, welcoming of new members, and reports from chapter committee chairmen.

The format is simple and flexible. Eight pages, each 8½ by 11 in. (size of typewriter paper) are generously filled with editorial copy. You don't get the impression that it is published merely to see

Continued on next page

William Bruning, left, editor, and Jerome Barfus, associate editor, share the major responsibility for getting the Long Island *Bulletin* published.

Two of the *Bulletin* feature writers, Augustine Lanzo and Robert Bradshaw, get assignments for articles in the October issue from Editor Bruning.

how many advertisements can be sold.

The layout calls for business card size ads. Format of a typical inside page finds two columns of editorial copy centered vertically with an ad at the top and bottom of each column, giving a total of four ads per page.

The front page has a standing head and the main elements are an outline map of Long Island with the chapter name and the title *Bulletin* superimposed over it. The front page is devoted to the coming meeting write-up and picture of the speaker. By placing this vital information on the front page, the publication can be more handily tacked up on local company bulletin boards.

The centerfold is reserved for a two-page feature usually done with an artistic layout and several photographs with accent on eye appeal.

Typical of such picture features were photographic spreads on new chapter officers, committee chairmen and plant representatives; a treatment of New York Tool Engineers Day; outing stories; and several salutes to Long Island industrial firms.

It must be emphasized that the *Bulletin* did not start out in present-day proportions. The first edition, which came out one month after Long Island's chartering in March of 1951, was but two separate mimeographed sheets stapled together.

Next to ingenuity of the staff members, William Bruning, present editor of the *Bulletin*, says that the outstanding cooperation of their printer, Bethpage Litho and Printing Co., has been one of the greatest factors in the publication's success.

In the very beginning the staff, then headed by Sara T. Moxley, found this printer whom they could rely upon to fit copy into allotted space, advise and counsel on make-up. Also, because the firm was new in the area and just getting started, it could offer them a reasonable rate.

Even now when the printing plant has expanded to the point where it has almost more business than it can handle, Long Island chapter still gets every

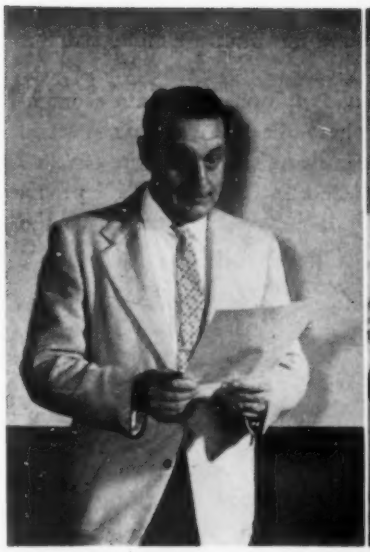
Continued on page 132

Photographer Russell Wygand lines up his subject for a picture while John Miller, center, feature writer, interviews Devon Plows, noted chapter violin virtuoso, for an October personality sketch.

Long Island chapter's answer to Al Capp is Art Grahame who, with a fine hand, is shown applying finishing touches to a piece of art work for the October *Bulletin*.

Business Manager John Bierschenk solicits advertising space from Jack Rettaliata, public relations director of Grumman Aircraft Engineering Corp.

Russell Wygand, seated center, photographic editor, goes over monthly assignments with his picture-taking crew which includes, from left: Augustine Lanzo, Warren Lipman and John Schinn.



Wide-eyed surprise is the reaction of Membership Chairman Vanderhoof as he receives notice that his committee report is due for the October issue. At far right, with the relaxed and relieved expression of one who has just made the deadline, he reviews fine points with Editor Bruning.

Before copy is taken to the printer, information is checked by, from left, Treasurer Harold Poett, Editor Bruning and Chairman George McLaughlin.

Once at the printing plant, original copy is set into type by the skillful fingers of the linotype operator.

consideration because it was one of the earliest customers. Mr. Bruning advises any chapter starting out to shop around and find a similar setup if possible.

The eight-page *Bulletin* is printed by an economical process called photo-offset. First copy is set in type and proofs are pulled. The proofs are checked for errors, corrected and finally, when OK'd proofs are pulled, the copy is cut out and pasted as the page is to appear on master sheets. Each page is treated as a unit. Screened photographs are used for reproduction.

The final stages include photographing the master sheets; transferring the resulting negative to a thin, flexible metal plate; developing and making ink-receptive and water repellent with a coating of greasy chemical; and imprinting on a rubber-blanketed cylinder which transfers it to the paper. All of this is done by the printer.

On the premise that "many hands make lighter work," nearly 20 Long Island members contribute spare time and effort for a single issue. Editor Bruning has 11 regular staff members and would like more. As editor, he oversees the entire operation.

He plans advance general layout, making assignments on subjects and amount of copy needed to his feature staff. He alerts photographers for pictures; plans financial budget with the business manager; and is a representative on the executive committee. In addition he edits and proofreads copy, finally checking all material with several chapter officers. He always has his ear to the ground for future articles.

Immediate past editor, Jerome Barfus, is now associate editor. He assists Editor Bruning, drawing upon past experience to serve in an advisory capacity. He also seeks to maintain high quality and policy, and steps in for proofreading duty or wherever else help is needed.

John Bierschenk, business manager, keeps a wary eye on the budget and solicits advertising. When a chapter member contacts a company which seems interested in having its name before the *Bulletin* readers, Mr. Bierschenk writes a letter to the firm.

Ads have been sold on a yearly contract basis until only recently. Many prospective advertisers were more inclined to buy space for a shorter time as an experiment and then renew upon satisfaction. Mr. Bierschenk sends out letters two months in advance to companies whose contracts are running out. Through its ads, the *Bulletin* is self-supporting and any profits go into the general chapter fund.

The circulation manager, Howard Mills, keeps the roster mailing list of preferred addresses up to date. He picks up the 800 finished copies at the printer's and takes them along with envelopes and stamps to the secretary, a woman hired by the chapter for this phase of operation. She types addresses on envelopes, stuffs and takes the *Bulletins* to the post office.

There is some additional circulation outside of the membership. The first issue, containing newly elected officers and committee chairmen, is sent to all other chapter chairmen. Others go to the chamber of commerce and to prospective members and advertisers.

The staff has experimented with several types of postage, but prefers first class postage because it ensures speedier delivery and cannot be mistaken for a circular and tossed aside by mistake.

Another important member of the staff is Arthur Grahame. With a flare for artistic sketches, he dresses up the *Bulletin* each month with seasonal and humorous illustrations. He has a light touch which adds distinction.

Eye appeal is also in the department of Russell Wygand, photographic editor. He and his staff of

Before actual press run in the off-set printing process, photographic negatives come to this man's table for careful retouching.

photographers consisting of Augustine Lanzo, Warren Lipman and John Schinn, are always behind the shutter when something important happens.

Four feature writers cover meetings, personality sketches and the many other miscellaneous items. They are: Robert Bradshaw, Augustine Lanzo, John Miller and Howard Mills.

Still others come in for writing assignments. An editorial is written each month, be it from the pen of the chapter chairman, one of the vice chairmen, or the editor. Also regular reports by chapter committee heads on their groups' activities are made.

The many panel discussions held by the Long Island chapter in addition to its regular meetings are assigned to a man in the field of the topic to be covered.

And so it goes—Chapter Chairman McLaughlin tells of interesting mail which comes across his desk; Ben Kirkup, chairman of the professional engineering committee, urges nonregistered members to prepare for exams; sixteen new members join chapter ranks; the student dinner dance at Long Island Agricultural and Technical Institute is an unqualified success; five chapter members get promoted on their jobs; George Dorne's hobby is the nearly lost art of wood marquetry—and it's all in the pages of the *Bulletin*.

THE TOOL ENGINEER news department salutes the Long Island *Bulletin* staff and all those volunteers at other chapters who give up coveted evenings at home with the family and week end football games—just to keep fellow members posted.

In the last phase of operation, Howard Mills, circulation manager, picks up the 800 copies of the *Bulletin* and takes them to the stenographer who will address and mail them to the membership.

The long awaited first printed copy of the October *Bulletin* comes off the presses ready for trimming.

After the ink has dried, the *Bulletin* is mechanically folded by the labor-saving machine pictured.

At the speakers' table, from left, were: Carl Kertesz, ASTE area membership captain; Marvin Bunting, ASTE staff administrator; Joseph C. Irwin, director, Monmouth County Board of Freeholders; George Eltz, toastmaster; John L. Webster, chairman, Monmouth ASTE chapter; Richard A. Smith, ASTE national director; Maj. Gen. Victor A. Conrad, commanding officer, Fort Monmouth; and Col. Leslie S. Fletcher, research director, ASTE Research Fund Committee.

Director Smith installs Monmouth chapter officers. From left: Vincent Jarman, treasurer; W. William Halbrook, second vice chairman; Laurence H. Seibert, first vice chairman; and John L. Webster, chairman. Secretary Erick Hanson was not able to be present for the charter meeting.

ASTE's Newest

MONMOUTH CHAPTER

Drawing membership from Red Bank, Eatontown, Long Branch, Matawan, Asbury Park and the Signal Corps' Engineering Laboratories at Fort Monmouth, ASTE's 130th chapter was chartered on Sept. 20.

The Society's newest chapter, officially named Monmouth, was chartered in ceremonies held at Joseph's Restaurant in West Long Branch, N. J.

The charter was presented by Richard A. Smith, ASTE national director. Other special guests included Major General Victor A. Conrad, commanding officer, Fort Monmouth; Joseph C. Irwin, director of the Monmouth County Board of Freeholders, who was main speaker; Carl Kertesz, area captain of the National Membership Committee; Colonel Leslie S. Fletcher, ASTE research director; and Marvin J. Bunting, staff administrator from National Headquarters.

Also on hand were members of the Philadelphia, Greater New York, Northern New Jersey, Long Island, and Paterson chapters.

In addition, attendance of the wives at the charter meeting may have established a precedent.

Monmouth's chairman, John L. Webster, is a past chairman of the Northern New Jersey chapter and has spearheaded the organization of the chapter.

The new chapter got off to a flying start with nearly 150 members including six affiliates.

The California STORY

By Paul B. Slater
Chairman, Los Angeles Chapter

Many questions relative to the growth of ASTE in California have prompted me to make these few notes and observations. It is hoped that some members in other areas will follow the pattern of the pioneers in California and thereby enjoy the pleasure of bringing the American Society of Tool Engineers to more people.

New chapters are born of some necessity. There are always reasons why a group of ambitious, energetic tool engineers get together and form a chapter.

Since California chapters of the Society have enjoyed a most phenomenal rise in new members, the writer feels stimulated to report some of the background of today's ASTE membership picture in California.

With apologies to Golden Gate, San Diego and Santa Clara Valley chapters, these few comments are confined to the Los Angeles-Southern California area. The main purpose for making these observations is to illustrate what can happen to ASTE growth in a metropolitan area through the establishment of additional chapters.

In 1950 while secretary of the Los Angeles chapter, it was my pleasure to listen to the saddening report that a Long Beach group had seen fit to organize and intended to ask for a chapter charter.

Arguments on the pros and cons on the subject lasted well into the night. "They can't do this to us!" said one Los Angeles officer. Nevertheless, the fact is that they did do it and in 1950, Long Beach chapter was chartered with 80 members.

At the time Los Angeles had 450 on the rolls, and to many the new chapter meant a decline in Los Angeles membership. To others it meant "Get in and get more members—get to work!" for Long Beach was a most enthusiastic group, obviously out to entice every possible member to join its chapter.

Imagine the pleasant surprise to find that at the end of the first year, Los Angeles had not gone down in number of members, but increased from 450 to 456, and Long Beach had gone from 80 charter members to a total 123 for a net gain in the area of 34 percent.

When San Gabriel Valley and San Fernando Valley were chartered in 1952 the atmosphere was changing to one of cooperation between groups.

Golden Gate assisted in the formation of Santa Clara Valley and membership in that area increased from 255 in 1951 to 440 in 1953, for a gain of 75 percent in two years.

Santa Ana Valley, Riverside and Centinela Valley have since been chartered. The chart indicates their very important position in this pattern. The totals indicate that California has grown 370 percent in five years, and that in spite of all the detractions, Los Angeles has risen from 450 members to 899 (Oct. 1, 1955 figure) for the period.

Geographically the Los Angeles meeting place is approximately central in location with Long Beach 20 miles south, San Fernando 16 miles

Continued on page 137

MEMBERSHIP STATUS SINCE MARCH 1950

Chapter	Chartering Date	Month of March					
		1950	1951	1952	1953	1954	1955
Los Angeles	7-20-39	450	456	556	670	860	873
Golden Gate	10-17-39	243	255	279	293	328	367
San Diego	11-14-41	79	60	79	112	149	231
Long Beach	4-5-50	80	123	152	222	272	286
San Gabriel Valley	4-11-52			74	228	272	294
Santa Clara Valley	6-17-52			81	157	184	225
San Fernando Valley	8-6-52			115	258	295	314
Santa Ana Valley	8-3-54					187	237
Riverside	12-3-54					139	159
Centinela Valley	7-12-55						94
Total membership for year		**852**	**834**	**1336**	**1940**	**2686**	**3180**

(First figure for the last six chapters is based on chartering date.)

exposition stickers ready

"Visit Our Booth" stickers will soon be in use by companies exhibiting in ASTE's forthcoming Industrial Exposition.

More than 700,000 stickers announcing the Exposition dates, March 19 through 23, and the location, the International Amphitheatre in Chicago, are being distributed to exhibitors this month.

A popular way to publicize the fact that a company will be represented at the ASTE Exposition, the gummed stickers are designed to be used on letters and envelopes and are being shipped to the 450 exhibitors who have already been assigned space at the Amphitheatre.

With less than three percent of the available space unassigned, the exhibit area is practically sold out, reports the exposition office.

In addition to the stickers, other mailings made to exhibitors during the next six weeks will include the Exhibitor's Handbook containing hotel reservation forms, general information, shipping instructions, and order forms for various services.

The Industrial Exposition will be held concurrently with five days of technical sessions and the Annual Meeting of the Board of Directors.

"New Vistas in Tool Engineering"

To Keynote Western Conference

An intensive two-day program awaits California tool engineers who will be attending the first on-campus conference at San Jose State College on Nov. 4 and 5. With "New Vistas in Tool Engineering" as its theme, the conference will offer six individual lectures plus a panel discussion on "The Role of the Tool Engineer in Industry."

Sponsors of the meeting are the ASTE National Education Committee, the Golden Gate and Santa Clara Valley chapters of the Society, and the engineering department at the college.

First technical speaker will be Harold Miller of the General Electric Micro Wave Laboratory who will discuss "Tooling for Electronic Components." Ben B. Berlien, national heat treating authority and member of the ASTE National Editorial Committee, will speak on "New Angles in Heat Treatment."

Plant organization problems will be covered by veteran writer and tool engineer, Andy Rylander, in his lecture "New Trends in Plant Layout." Friday's program will close with a discussion of "Mass Production Control" by J. A. Richardson, manager in charge of production, Milpitas Assembly Plant, Ford Div., Ford Motor Co.

The conference will convene Saturday to hear a lecture on "New Materials in Industry" by August Hill, chief tool engineer of Convair's San Diego plant. Also representing the aircraft industry, Lowell Hand of the tool engineering department at Lockheed Aircraft in Burbank will discuss "Three Dimensional Machining."

The concluding session will feature a panel led by Prof. Frederick Preator, head of the tool engineering department at Utah State College and member of the ASTE National Education Committee.

Discussing the tool engineer's present role in industry will be: George Gayer, manager of the Sunnyvalle Plant, Westinghouse Electric Co.; Walter Kassebohm, vice president, Merchant Calculator, Emeryville; James Ellison, president of Herron, Rickard & McCone; Donald Kudlich, corporate coordinator of manufacturing, Mechanical Divisions, Food Machinery & Chemical Corp., San Jose; E. K. Freidli, manager of production, International Business Machines Co., San Jose; and E. Cameron, vice president of production, Varian Associates, San Carlos and Palo Alto.

Dr. Gerald **Matchett, center, was opening speaker in Rockford's five-week course. J. J. Winkler, right, explained Barber-Colman's replacement program. Howard Nelson, left, was the '54-55 education chairman.**

Semiannual Meeting

On Oct. 28-29 the Board of Directors of the American Society of Tool Engineers will convene at the Hotel Statler in Detroit for its semiannual meeting.

Major consideration will be given to discussion and approval of the 1955-56 budget. No other activities are scheduled.

This meeting, like all Board meetings, is open to members. Those desiring to attend are cordially invited to be present at any or all sessions.

(Continued from page 135)

north, San Gabriel, 25 miles northeast, Santa Ana 15 miles southeast, and Centinela Valley 12 miles southwest.

Meeting nights do not conflict, making it possible for an ambitious member to avail himself of up to seven different technical subjects a month, all sponsored by an ASTE chapter.

An interchapter council made up of three members from each chapter meets quarterly to plan policy for the area; the area lieutenant calls all membership committee chairmen together twice a year and they in turn sell ASTE to potential members in their chapter areas.

Ideas for Education Activities Offered In Reports from Mid-Hudson and Rockford

Chapters searching for additional education activities to sponsor in the field of tool engineering should note the type of programs supported by Mid-Hudson and Rockford chapters. Although varying somewhat in scope of material and the manner offered, both programs prove the worth of continuing education in courses associated with tool engineering.

In cooperation with other technical societies and the adult education program of the local board of education, Mid-Hudson chapter at Poughkeepsie, N. Y. is sponsoring evening courses in industrial subjects at Arlington High School.

The classes, which have become an annual project for the chapter, are instructed by chapter members: J. Harry Keller (second vice chairman), Stanley P. Cook (professional engineering chairman), and C. Morgan Newbury (1954-55 education chairman).

Subjects being covered this year include courses on: machine tools acquaintance—designed to familiarize men with the uses and history of modern manufacturing methods; supervision—organized to acquaint supervisors and potential supervisors with the basic principles underlying the management of men and processes; and mechanical drawing—covering drawing instruments and their uses, lettering, applied geometry, projection, dimensioning, auxiliary views, sections and conventions, tolerances and fits, component illustration, assembly, detail and charted drawings.

Education in replacement of capital equipment was the objective of a five-week course offered as a public service last year by Rockford ASTE chapter. Classes were held one night a week at Rockford College, with an enrollment of more than 60 participating. Membership in ASTE was not required and all companies in the area were invited to send representatives to the course.

The first and last meetings were conducted by Dr. Gerald Matchett, director of National Center of Education and Research in Dynamic Equipment Policy, Illinois Institute of Technology. Intervening lectures were presented by equipment executives from three Rockford plants which have employed scientific replacement policies for several years.

The combination of the theoretical and the practical provided an excellent education in what MAPI formula is and how it is applied, both from the standpoint of buying equipment and selling equipment.

Taking part in other sessions were: David Crew, staff assistant in charge of replacement, Sundstrand Machine Tool Co.; J. J. Winkler, replacement manager, Barber Colman Co.; and Edson Gaylord, machine tool sales manager, Ingersoll Milling Machine Co. Robert Hunsaker of Twin Disc Clutch Co. acted as moderator.

As a result of recognition for the education program sponsored jointly by Mid-Hudson chapter and Arlington High School adult education department, C. Morgan Newbury, 1954-55 ASTE education chairman, and Walter Neidhart, director of the school's adult program, were asked to participate in the conference on New York State Public School Adult Education held earlier this year at Syracuse. They're pictured here (standing second and third from left respectively) with one of the panel groups which took part in the three-day meeting. The Honorable Averell Harriman, governor of New York, was a guest at one of the conference programs.

Racine Circulates Survey Questionnaires

Chairman Robert N. Freres opened the first meeting of the season by distributing questionnaires to the membership to help determine preferences on future operation of the chapter.

Announcement was made at the meeting, held Sept. 12 at the Racine Manufacturers Association, that chapter membership is now 215. Gilbert E. Hansen, membership chairman, urged everyone to continue efforts toward obtaining new members.

A check for $100 was presented to Ronald Hart, winner of the 1955 scholarship award, who is a first year student at the Milwaukee School of Engineering. The presentation was made by Education Chairman Byron L. Peterson who also introduced Donald Born, last year's education award winner.

Because of a confused calendar, the scheduled speaker was not able to attend and Chairman Freres took over the technical talk "Elox Process of Electrical Discharge Machining," explaining the basic principles of the method. *—Alvin J. Michna*

E. C. Schmid Named Manager

E. C. Schmid has recently been appointed general manager of the Electric Radiator Corp., Paris, Ky., a subsidiary of Landers-Frary & Clark of New Britain, Conn., manufacturers of Universal appliances. Mr. Schmid is a member of the St. Louis ASTE chapter.

BINGHAMTON—"Printed Wiring and Its Manufacture" was discussed Sept. 7 by O. I. Steigerwalt, left, research engineer, Erie Resistor Corp. Pictured with him are Phil Taylor, center, chapter chairman; and Paul Adamek, program chairman. *—Glyn Williams*

Long Beach Hears About Nuclear Power Plants

Meeting for the first time at Lakewood Country Club, 80 Long Beach members were present on Sept. 7 for the opening meeting of the season. Two speakers addressed the group—Robert L. Olsen, mechanical engineer with the nuclear engineering and manufacturing division of North American Aviation Co.; and Prof. Russell B. Lindskog, who is serving with a branch of the Federal Government.

Mr. Olsen spoke on construction of nuclear power plants. Prof. Lindskog's subject concerned future use of atomic energy. *—Jack Irby*

LOS ANGELES—New members attending the September technical session, from left, included: Erland G. Paulson, John A. Rechns, Roger K. Farrar, Ed Leis, Nelson E. Heindl, and William H. Pike, membership chairman. Speaker at the meeting, attended by close to 150 members and guests, was W. E. Brainard, assistant to the vice president of manufacturing, Hughes Aircraft Co. He discussed "Automation in Low Volume Production."*—Roland Hamel*

New Film Accompanies Discussion on Abrasives

A new color film produced by Norton Co. accompanied the technical discussion at the Sept. 20 meeting of Northern Massachusetts ASTE members. Program speaker, Gordon T. Rideout, abrasive engineer with the Worcester, Mass. company, talked on abrasives, their development, use and importance to industry and later showed the movie which pictured mining of bonded ingredients, forming of grinding wheels, and several other operations. During the instructive question period which followed, much interest was shown in ceramic tools. Attendance at the meeting, held at Greenfield Country Club, was about 115 members and guests.

G. T. Rideout

The chapter's university extension program for engineers, inaugurated last year in cooperation with the State Department of Education, was resumed the latter part of September. Scheduled classes include mathematics, English and engineering drawing.

—Otto S. Nau

Technical Speech, Picnic Start Grand River Season

Sept. 9 and 10 were ASTE meeting days for members of Grand River Valley chapter. The first session, held at Galt, featured a discussion and movie on chip breakers and tool design by M. Troup, tool designer for Kennametal, Toronto.

The second meeting was devoted to the chapter's annual picnic, held at Waterloo County Rod and Gun Club with an attendance of 250 taking part. Activities included various sports, smorgasbord dinner and awarding of prizes.

—W. C. Little

Ron Troupe Speaks At Niagara District

Ron Troupe of Kennametal, Inc., was the guest speaker at Niagara District's Sept. 1 meeting at the Queensway Hotel in St. Catharines, Ont. Sixty members heard his discourse on "Design of Chip Breakers in Carbide Application." Mr. Troupe stressed that it is now possible to control "chip" rather than having the chip control the operation in carbide applications. The movie "Trends in Carbide Tooling" was shown. *—William Yaeger*

ASTE Program Features "Operation Pushbutton"

Automatic operation of machinery through pushbutton control was the topic discussed at the September meeting of Benton Harbor-St. Joseph chapter. Speaker was E. C. Benzing, Jr., Chicago district manager for Bellows Co. A film pictured the achievement in time, cost savings and beneficial reduction in worker fatigue. Close to 50 persons were on hand for the meeting at Tosi's. —*Orvis L. Johnson*

Williamsport Visits Sylvania Radio Tube Div.

A plant tour on Sept. 12 launched fall activities for Williamsport chapter. About 75 members met at Mill Hall, Pa., to visit the Radio Tube Division of Sylvania Electric Products, Inc. Before the tour, plant manager Mile Balog explained how automation is used in the manufacture and assembly of component parts of a receiving tube.
—*Joseph B. Gehret*

Northern New Jersey Hears Product Engineer

"Gear Generating Tools—Their Design and Use" was the program topic for the Sept. 13 meeting of Northern New Jersey chapter. About 80 members were on hand to heard speaker J. Robert Moore, chief product engineer, Union Twist Drill Co. He gave a brief explanation of the theory of gear form and then, as he described each

J. Robert Moore, left, was introduced by William K. Perry, first vice chairman.

type of tool on display, he passed samples of form cutters, hobs and gear shavers through the audience.

During the meeting, Vice Chairman Herbert E. Dietrich introduced two exchange students from Germany—Jean Mittendorf and Siegfried Seifart—who were recently graduated from Manhattan College. —*Orlyn Kimmell*

TOLEDO—Elmer J. Vanderploeg, center, chief engineer for The Yoder Co., presented "Possibilities and Limitations of Cold Rolled Forming" for members of the Toledo chapter at the Maumee River Yacht Club Sept. 14. Left to right are: Julian Pawlin, program chairman; Walter Toepfer, chairman; Mr. Vanderploeg; Richard Burt, personnel director of The Yoder Co.; and James F. Sullivan, treasurer. —*H. H. Krueger*

V. J. Taylor Addresses San Gabriel Members

Victor J. Taylor, district manager of the American Brake Shoe Co., Amforge Division, was the guest speaker for San Gabriel Valley chapter's August 4 meeting held at the Rainbow Angling Club. "Forging in Closed Dies" was the subject of the presentation and was aptly revealed by a motion picture, including steam and air lift hammers, board hammers and mechanical and hydraulic presses in action. —*Everett S. Nance*

Boston Program Offers Impact Grinding Discussion

One hundred fifty members of Boston chapter attended the September technical session and heard a talk by Ralph M. Moschella, manager of sonic products, Raytheon Mfg. Co. The meeting was designated as past chairmen's night.

Speaking on "Impact Grinding," Mr. Moschella, with the aid of slides, explained basic setup of ultrasonic machine tools. —*Evo P. Castelli*

Positions Available

SALES REPRESENTATIVES WANTED —to handle finest line of German-built machine tools—such as Lindner Jig Borers, Bokoe Special Millers and other reputable tools (all backed by Orban Service and spare parts). Will consider supplementing your present lines. Many open territories. Call or write, furnishing full particulars to Kurt Orban Co., Inc., 34 Exchange Place, Jersey City 2, N. J.

MANUFACTURING ENGINEER—a senior opening exists in the newly formed manufacturing engineering department for an experienced man on pressure vessels, heat transfer equipment, sheet metal and light structural fabrication, copper smithing, general machining and other methods of a job shop operation producing low temperature process equipment. Object is to increase efficiency, reduce cost and to provide liaison between engineering and manufacturing. Three factories employ over 700. Management opportunity in a young rapidly growing company. High salary plus profit sharing. Send complete history to B. H. Van Dyke, Air Products Incorporated, P.O. Box 538, Allentown, Pa.

TOOL ENGINEER—Large well-established manufacturer of metal products located in Boston desires a qualified tool engineer for expansion of new department. Mechanical engineering degree desirable but not necessary. Ten years experience. Send resume including present salary to Box 058, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

Position Wanted

CHIEF PRODUCTION ENGINEER OR TOOL AND DIE SHOP MANAGER—present position of chief production engineer of medium-size firm with responsibility for and excellent results in initiating and executing a manufacturing engineering program with emphasis on cost reduction; supervising efficient departments of process engineering, tool engineering, industrial engineering, toolroom and tool control. I have a working knowledge of production planning and control, quality control, plant engineering and cost accounting. Have excellent background and experience in modern precision manufacturing process methods, processes, tooling, organization and procedures, supervisor, manufacturing engineer and job shop and tool and die maker. Salary and location open. Write to Box 057, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TUCSON—Much of the credit for the success of the third annual splash party, held Aug. 20 at the El Conquistador Hotel, is due this group of committee members who were in charge of arrangements. From left: John Oberteuffer, chapter first vice chairman; Allan Hansen, head of the raffle committee; Harry McClain, chapter chairman; Bob Nordstrom, emcee; and Chet Vermilyer, program committee member. One hundred and two members, wives and guests participated in party activities.

Piedmont Publishes First Pocket Program

Now in the hands of all members of Piedmont chapter, the first annual pocket program was recently published under the direction of Program Chairman Dick Calvert. A rising vote of thanks for his fine work was given at the chapter's Sept. 19 meeting.

Speaker at the session was D. S. Schultz, field engineer with the Micro-Switch Div., Minneapolis-Honeywell Regulator Co. He showed a film "Uses Unlimited" which pictured the manufacture and application of the many variations of Micro-Switches. The movie was followed by a lively discussion period. —*Howard A. Longfellow*

Annual Field Day Held By London-St. Thomas

Ingredients in the Sept. 18 field day held by London-St. Thomas chapter were golf driving, putting, nail driving contests and dart and horseshoe games. Members and friends polished off a smorgasbord to climax their day at Dreamland in Dorchester. Chief chef was Al Trueman. —*Richard J. Merriott*

Industrial Engineer Speaks at Kalamazoo

Speaking on "Machine Tool Capabilities," Brent C. Jacob, Jr., chief industrial engineer for Chrysler Corp., addressed members of the Kalamazoo chapter on Sept. 22. Examples of the technique of quality control, including actual problems and their solution, were given. Robert Tappler, supervisor of quality control at Chrysler, assisted Mr. Jacob. —*T. J. Cook*

L. A. Williams Speaker At Fond du Lac Meeting

L. A. Williams, president of Anocut Engineering Co., discussed "Electrolytic Grinding" for 60 members of the Fond du Lac chapter on Sept. 23. In describing the Anocut electrolytic grinding, Mr. Williams pointed out that it was applicable to most conventional precision grinding processes, such as offhand, chip breaker, surface and cutter grinding. The meeting was held at the Elks' Club House in Green Bay, and arrangements were made by William H. Jorgensen. —*Walter M. Gradolf*

Twin Cities Members See "Operation Pushbutton"

The motion picture "Operation Pushbutton" was shown to 85 members of the Twin Cities chapter on Sept. 7 at Dunwoody Industrial Institute. Guest speaker, J. James Mudd, assistant manager of field engineers and sales, The Bellows Co., gave an authentic account of how air motors, drill press feeds and air-powered devices are used.

The annual dinner dance held at the Raddison Hotel on Sept. 17 drew attendance of 340 members and guests. Chairman of the successful event was Gerald F. Oppel. —*R. Roy Wressell*

National Officers Attend Chicago ASTE Meeting

Harry B. Osborn, Jr., ASTE president, and Harry E. Conrad, executive secretary of the Society, were special guests at Chicago chapter's Sept. 12 meeting. The session program included presentation of awards and a talk on automation by M. A. Hollengreen, president of the National Machine Tool Builders Association and also president of Landis Tool Co. and Gardner Machine Co.

Past Director Fred Schmitt was honored at the meeting for his past service to the chapter, and two scholarship awards were presented to outstanding students from Northwestern University and Illinois Institute of Technology.

—*L. B. Klemme*

LOUIS JOLIET—H. Verne Loeppert, left, chairman of the National Membership Committee, was a special guest speaker at the Sept. 20 meeting held at the Woodruff Hotel. Pictured here with H. E. Hintz, Chairman "Doc" Powers, R. S. Klarish, and Lou Prencis. Mr. Loeppert gave a brief talk on ASTE objectives and commented on the growth of the Society. Technical speaker at the session was Stanley R. Copes, president of the Acme School of Die Design and Colfax Tool and Engineering Co. His topic was "The Technical Consultant's Place in the Metal Stamping Industry." —*Ken Hanks*

Director Charles M. Smillie Visits Lansing Chapter

Charles M. Smillie, member of the ASTE National Board of Directors and president of the Chas. M. Smillie Co., Detroit, was a special guest speaker at the Lansing chapter's Sept. 12 meeting. He reviewed past history of the Society and outlined positive goals for all chapters. —*Hal Buehler*

"Economics of Tool Life" Outlined at Milwaukee

In a talk before 85 Milwaukee members, C. L. Fralick, tool research engineer with International Harvester Co., spoke on the many factors in controlling tool cost. Among the points he covered were: maintaining and servicing tools; proper planning and choice of tools; use of carbide speeds and feeds on machines; importance of lubricants; and long and short-run jobs.

Two scholarship winners, Robert Kutschera and Kenneth Voight, were introduced to the chapter by Roy Radke, chairman of the education committee. —*Walter Behrend*

Little Rhody Members Tour Foxboro Plant

Approximately 100 members of the Little Rhody chapter toured facilities of the Foxboro Co. plant, makers of indicating and recording instruments for temperature, pressure, humidity and flow, on Sept. 1. Mr. Gilmore, assistant superintendent of manufacturing, outlined operations and the group was conducted through the plant by company engineers. —*Richard H. Kilbane*

Investment Casting Discussed at Tucson

Fall technical activities for Tucson chapter began Sept. 13 with a talk and film on the "lost wax" and mercury methods of investment casting. Addressing the audience of 52 members was J. B. Price, sales manager of the Western Div., Arwood Precision Casting Co., Los Angeles. —*J. W. Vincent*

Hamilton District Members Tour Jet Engine Plant

Canada's sole designer of jet engines, Orenda Engines, Ltd., was toured by members of the Hamilton District chapter on Sept. 8. The group met in Hamilton and traveled by bus to Malton to see the plant. Major assembly parts were displayed and the principles of operation of the jet engine were explained before the group was conducted through the plant. —*W. A. Marcellus*

LONG ISLAND—The affiliate membership plaque for American Machine and Foundry Co. was presented Sept. 12 to John Longenecker, right, by Charles Vanderhoof, membership chairman. Also presented was a membership plaque for the Joseph A. Battlle Co., Inc.

Long Island Hears Talk By Product Engineer

Featured speaker at Long Island's Sept. 12 meeting was Jack Wagner, product engineer at Arma Div., American Bosch Arma Corp. Using an example of the wide variation possible in fits of a standard bearing, he illustrated the need for close cooperation between the shop, quality control and engineering departments.

He described the use of the normal curve statistics in determining allowable tolerances on production items, and the importance of continuous roving inspection to insure that a normal distribution of tolerances is maintained.

The meeting at Garden City Hotel was attended by 100 persons.
—*William H. Bruning*

Education Award Winner Lima ASTE Meeting

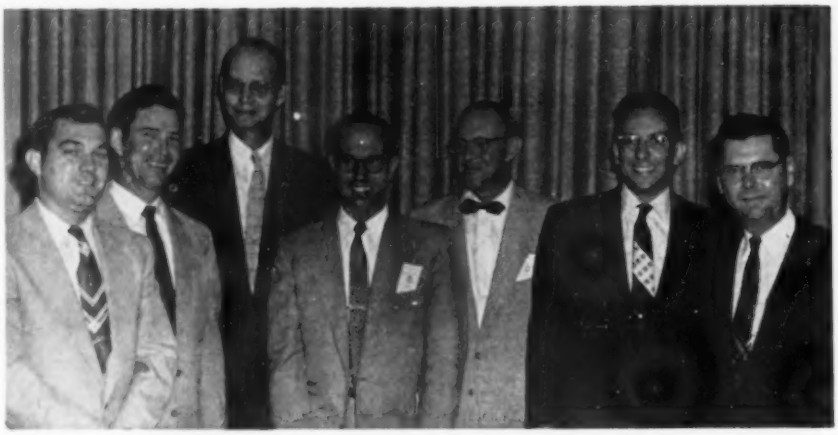
Present at the Sept. 15 meeting of Lima chapter was Carl D. Steuber, sophomore engineering student at Massachusetts Institute of Technology and winner of the chapter's annual $250 scholarship. He was introduced to the 44 members and guests on hand for the first fall ASTE meeting, held at the Clemens Building. Program speaker at the session was Stewart M. Depoy, metallurgical and heat treat superintendent, Dayton Forging and Heating Co. His address was directed toward the proper machining and selection of tool steels to avoid possible warp and cracking in sections of uneven mass. His helpful hints on the separating of large die sections, to produce dies easier to build and less apt to fail in heat treatment was of special interest to the members.
—*Donald McCain*

Carl Steuber

Labor Relations Director Presents Saginaw Lecture

Speaker at the September meeting of Saginaw Valley chapter was George Gullen, Jr., director of labor relations at American Motors Corp., Detroit. Addressing some 85 members at Zehnder's Hotel in Frankenmuth, Mr. Gullen spoke on getting the most out of what you know. —*Kent B. Arnold*

HOUSTON—The occasion was the opening meeting of the year, the date Sept. 13, and the place was Wyatt Metal and Boiler Works where more than 80 members and guests met for dinner and a plant tour. Pictured being served by Sonny Look are John Henley, left, and Past Chairman T. J. Gilchrist. Photograph by Shelby Herron.
—*George Bo-Linn*



INDIANAPOLIS—Pictured at the opening meeting of the year, from left, are: John A. Huser, first vice chairman; Ted Harding, chairman; Dick Garber, second vice chairman; W. F. Svendsen and George Abbe, both of Pacific Industrial Mfg. Co.; Murray Davidson, treasurer; and Roy Erickson, secretary. About 60 members were present to hear Mr. Svendsen's talk on sheet metal fabricating with Pacific hydraulic brake press and presses.—*Dorman B. Dickerson, Jr.*

James Metcalf Resigns As San Antonio Chairman

The first meeting of the season for San Antonio chapter was the last for James Metcalf in his official capacity of chapter chairman. Mr. Metcalf, who resigned his post because of the ever pressing demands of the business world, however, remains as an active member. First Vice Chairman O. G. Tobias will take over as chairman until the annual election of officers.

Home workshops took the spotlight in the technical portion of the meeting. F. Keepers of Reynolds Metals Co. demonstrated the ease and practicability of the new alloys for use in home workshops; L. Smith of Skilsaw, Inc., showed the adaptability of various Skil Tools; and J. Eigenberger of A. M. F. DeWalt Co., Inc., climaxed the evening with a presentation of the DeWalt "Power Shop." The meeting was held at the Gunter Hotel on Sept. 14.

On Sept. 20 San Antonio chapter held its second annual ladies' night in the Pearl Corral Room. Plans for the event made by O. G. Tobias and O. Wunsch, included chicken barbecue served to 180 members and guests.

—*Eleanore Kennedy, Stanley G. Gower*

Arthur J. Zwanzig Appointed Vice President

The appointment of Arthur J. Zwanzig as assistant to the vice president and general manager of the Alloy Precision Castings Co., Cleveland, has been announced by Frank W. Glaser, vice president and general manager. Mr. Zwanzig, a member of the Long Island chapter of ASTE, was formerly associated with American Electro Metal Corp. as chief engineer.

Springfield, Mass. Chapter Holds Annual Steak Roast

Sept. 10 was the date of the annual steak roast staged by Springfield, Mass. members at Streamline Golf Course at East Longmeadow. About 200 persons participated in the program of golf, horseshoes, cards, darts and other events. The menu for the day included lunch, a 2 p.m. appetizer of clams, chowder and broth, and, of course, steak dinner. Some 155 choice prizes were awarded at the conclusion of activities.

—*Allen M. Johnson*

W. N. Parker Addresses Lancaster Chapter

With slides to show dimensions of parts and tools in operation, a discussion of rolled extrusion of thin walled parts was presented Sept. 13 at a meeting of Greater Lancaster chapter. Addressing the audience of 60 members and guests was William N. Parker, development engineer, Tube Div., Radio Corporation of America. He brought along the rolling tool and some parts manufactured by this process at RCA for exhibiting after his lecture.

W. N. Parker

Questionnaires for those interested in tool engineering courses sponsored by the Pennsylvania State University Extension and the Greater Lancaster ASTE education committee were distributed at the meeting by Vernon VanHorn. A total of 60 persons subsequently signed up on Sept. 21 for the classes offered at McCaskey High School.

Another chapter activity in September took 31 members to DeWalt, Inc. in Lancaster where they viewed operations for the manufacturing of saws. Three films were shown as part of the afternoon program. —*Norman Ressler*

WORCESTER—Speaking at a joint meeting of ASTE members and the Society of Carbide Engineers held Sept. 19 was Dr. Robert S. Hahn, seated, center, consulting engineer, The Heald Machine Co. He addressed a group of 125 persons on the subject "Improvement of Machined and Ground Surfaces Through Vibration Control." Shown with Dr. Hahn are J. Irving England, seated, left, ASTE chairman; Bradford L. Smith, seated, right, SCE chairman; (standing from left) Leo P. Tarasov, ASTE first vice chairman; John C. Baker, Jr., SCE treasurer; John C. Lalor, ASTE secretary; and Stanley P. Waska, SCE program chairman.—*R. H. Mead*

Development Engineer Speaks at Rockford

First meeting of the 1955-56 season for Rockford chapter concerned machinery shown at the NMTBA show in Chicago by Rockford Machine Tool Co. Speaker was Earl W. Johnson, chief development engineer for the firm. He discussed the development and application of the "Rockford Kopy Kat," a hydraulic tracer control for planers, shapers and vertical slotters. A film demonstrated the "Kopy Kat" in use.

Coffee speaker at the Sept. 22 session was Curtis H. Moore, director of adult education for Rockford College, who told about the Rockford Men's College and the pre-engineering institute. More than 100 members attended the program held at Lafayette Hotel.

—Les Teachout

Chapter Member Presents Montreal Technical Talk

Local talent scored another success at the September meeting of Montreal chapter when A. Beausoleil, project engineer with Jeffrey Mfg. Co., addressed members on "Tooling for Short Runs." Mr. Beausoleil showed how jobs can be simplified by using automation principles, and how costs can be reduced on short runs by building inexpensive fixtures and eliminating costly setups.

A lively discussion followed during which many members aired their own problems and received helpful suggestions from the audience. After the meeting, refreshments were served through the courtesy of Jeffrey Mfg. Co.

Eleven new members were introduced at the session and were presented their ASTE pins from Membership Chairman J. McKee. *—T. J. Tracey*

St. Louis Chairman Named Vice President

Glen Dilling, chairman of the St. Louis ASTE chapter, has been elected vice president in charge of engineering by the board of directors of General Metal Products Co. He has been with the company since 1949 as production engineer.

Tennessee Engineering Exam Passed by Otis W. Dresslar

Otis W. Dresslar, past chairman of the Nashville chapter of ASTE, is now a registered professional engineer in the state of Tennessee. A consulting engineer in the city of Nashville, he has served as chairman of ASTE chapter committees on membership, standards and professional engineering.

INDIANA COUNCIL AND REGIONAL STANDARDS MEETING—When these representatives of eight Indiana ASTE chapters met Sunday, Sept. 18 to begin plans for next year's Purdue University on-campus conference, time was set aside for a regional standards meeting conducted by William Moreland, National Standards Chairman, and Joe Penn, National Standards Committeeman. They led a discussion on accomplishments of individual chapters in reviewing ASA standards.

DETROIT—This group of new student, junior and senior members was welcomed to ASTE at the Sept. 15 meeting held at the Engineering Society of Detroit.

SAN FERNANDO VALLEY—Eighty-five members and guests met Sept. 7 to hear a talk on low temperature melting alloys and their uses. Program speaker was O. J. Seeds, seated, second from left, who is manager of the alloy sales division of Cerro de Pasco Corp. His presentation on some of the latest uses for low temperature metals resulted in a flood of questions which lasted for nearly three hours. Shown here with the speaker, from left, are: A. T. Rando, first vice chairman; R. C. Broomel, second vice chairman; Mr. Seeds; K. H. Griffin, chairman; J. R. Bethune, secretary; and Charles Goodspeed, treasurer.—*Sam Schwartz*

coming ASTE meetings

National

ANNUAL NOMINATING COMMITTEE—for National ASTE Board of Directors, Nov. 4, Boston.

NATIONAL EDITORIAL COMMITTEE—Nov. 12, National Headquarters, Detroit.

NATIONAL BOOK COMMITTEE—Nov. 14, National Headquarters, Detroit.

NATIONAL PUBLIC RELATIONS COMMITTEE—Nov. 19, National Headquarters, Detroit.

On-Campus Conference

SAN JOSE STATE COLLEGE—Nov. 4-5, San Jose, Calif. Sponsored by Santa Clara Valley and Golden Gate Chapters of ASTE.

Chapter

BATTLE CREEK—Nov. 14, 6:30 p.m., American Legion Clubhouse. First annual ladies' night.

BENTON HARBOR-ST. JOSEPH—Nov. 10, Tosi's. "Silicones as Engineering Materials" by Paul Schreiber of Corning Corp.

CEDAR RAPIDS—Nov. 15, 6 p.m., Crystal Room, Hotel Montrose. "Progress Report on Office Automation" by W. R. Graves, manager, EDPM Special Dept., International Business Machines Corp.

COLUMBUS—Nov. 9. Plant forum, Ranco, Inc.

DAYTON—Nov. 14. Discussion of Analog Computer by representatives of General Electric Co.

LANSING—Nov. 14, 6:30 p.m., Mason Cafeteria. "Tooling for Automation" by Harry Conn, chief engineer for Scully-Jones & Co.

LEHIGH VALLEY—Nov. 18, 7:45 p.m., Carpenter Steel Co., 101 W. Bern St., Reading, Pa. Plant tour.

LONG ISLAND—Nov. 14, 8:30 p.m., Garden City Hotel, Garden City, N. Y. "Machine Tools and Vibration" by Frank E. Chase, New York district manager, Consolidated Engineering Corp.

LOS ANGELES—Nov. 10, 7 p.m., Hotel Ambassador. First annual executives' night.

LOUIS JOLIET—Nov. 15, Dinner and tour of Scully-Jones & Co.

MID-HUDSON — Nov. 15. "Hydroform and Hydrospin" by George Beatty, field engineer, Cincinnati Milling Machine Co. Also "Heart Disease" by Dr. John E. Sarno.

MILWAUKEE—Nov. 10, 6:30 p.m., Allen Bradley Co. Cafeteria, 2nd and Greenfield Aves., Milwaukee. Hospitality night with films, dinner, entertainment.

NEBRASKA—Nov. 17, Omaha. Plant tour of Falstaff.

NIAGARA DISTRICT—Nov. 3, Queensway Hotel, St. Catharine, Ont. "Cold Flow Process and Pressworking" by G. Sommer, chief development engineer of Clearing Machine Corp.

NORTHERN MASSACHUSETTS—Nov. 15, 7 p.m., Eagles Hall, Gardner, Mass.

ASTE Industrial Exposition and 24th Annual Meeting will be held March 19 through 23, 1956 at Chicago, Ill. The Exposition will be held at the International Amphitheatre.

"Drills and Tapping Problems" by John Hayes of Morse Twist Drill Co. Plant visitation during afternoon at Haywood Wakefield Co., Gardner, Mass.

PIEDMONT—Nov. 7, Robert E. Lee Hotel, Winston-Salem, N.C. Executives' Night. Speaker will be Hon. Thurmond Chatham, member of Congress, fifth district of N.C.

PORTLAND, ORE.—Nov. 17, [illegible]rns Restaurant. "Machine Tool[illegible]d Vibration" by E. D. Pettier, [illegible]ineer for Consolidated Engineering [illegible]orp.

SAN FERNANDO VALLEY—N[illegible] 5, 7 p.m., Hody's, North Hollywood. Operation Pushbutton," automation [illegible]y use of air-operated mechanisms [illegible]y George Cook and Roy McCloud [illegible]f Bellows Corp.

SOUTHERN MASSACHUSETTS—Nov. 15, Stevensons, North Dartmouth, Mass. Executives' Night. Speaker will be H. E. Linsley, associate editor of *American Machinist*.

SPRINGFIELD, MASS.—Nov. 8, 7:45 p.m., The Ivy House, West Springfield, Mass. Executives' night. Speaker will be Joseph P. Crosby, past national president of ASTE.

TOLEDO—Nov. 9, Maumee River Yacht Club. "Factory Methods, Time Study and Production Control" by H. K. Keever of Stevenson, Jordan & Harrison, Inc.

TUCSON—Nov. 8, 7:30 p.m., Georgett's Restaurant, Tucson. "Tool Engineering at Home and Abroad" by H. E. "Rip" Collins, manager, Process Engineering, Hughes Tool Co. and national vice president of ASTE.

TWIN STATES—Nov. 2, Claremont, N. H. Past chairmen's night. "Electronic Equipment for Industrial Machinery" by D. R. Percival, J. A. Mason and F. P. Dunigan of Machinery Electrification, Inc. Special guest was Harry B. Osborn, Jr., national president of ASTE.

WINDSOR—Nov. 14, 6:45 p.m., Prince Edward Hotel, Windsor, Ont. "Ultrasonic Machining of Hard Materials" by George Brown of Sheffield Corp.

WORCESTER—Nov. 1, 7 p.m., Putnam and Thurston's. "Taps and Tapping" by G. H. Stimson of Greenfield Tap and Die Corp.

DECATUR—This group of more than 100 ASTE members and guests was on hand for the chapter's technical meeting and program held in July.—*B. Paul Taylor*

Portland Chapter Holds Panel Discussion

The recent machine tool and production engineering shows held in Chicago were the subjects of a five-man panel discussion at the Sept. 22 meeting of the Portland, Ore., chapter. All spoke on their observations at the shows.

Fred Mondin, past chairman of the chapter, spoke on new machine styles, speeds and production; Ted Adrianoff discussed machine cutting speeds and versatility; William Brennan reviewed automation and its applications and job setups; Daniel Melady talked about automation and sequences of continuous operation; and Prof. Keith Sunderlin of Oregon State College revealed the horsepower required to operate these new tools and machines at maximum efficiency.

Past Chairman Fred Mondin received the past chairman's pin from Chairman Fred Allen. Forty-two members attended this dinner meeting at Burns Restaurant.

—Walter L. Brenneke

AMA Representative Heard at Mid-Hudson

In a talk entitled "This Road Goes Two Ways," Clancy A. Isaac, president of Graphic Information Corp., told Mid-Hudson ASTE members of the close tie between the nation's economy and the production of industry. Mr. Isaac was representing the National Association of Manufacturers in his appearance as principal speaker at the ASTE session. Coffee speaker at the meeting was Mark E. Killian, factory representative for Osborn Mfg. Co., who showed his firm's color film on "The Art of Brush Making." About 70 members and guests were on hand for this first fall program.

C. A. Isaac

—Davis Gale

Erie Members Tour Alcoa's Cleveland Plant

A happy mixture of social and educational activities occurred for the Erie chapter on Sept. 17 when members chartered a bus to tour the Alcoa Plant in Cleveland and stayed on for a Detroit-Cleveland baseball game. The group was conducted through the Air Force Large Press facilities.

—D. J. Beecher

Jerry West and Ivan Shepherd

Business Opportunities Pictured at Evansville

A movie entitled "It's Everybody's Business" was a highlight of Evansville's September meeting. The film, which portrayed a lighthearted approach to the history and development of business opportunities in America, was presented by Jerry West and Ivan Shepherd of Igleheart Bros., a division of General Foods Corp.

Coffee speakers on the program were Paul Beck, Evansville College football coach, and his assistant, Forrest Page. Their topic, naturally enough, was football and the discussion centered chiefly on football tacts and the future of Evansville College in the football world.

—William H. Brooks

Dayton Chapter Visits Armco Steel Corp. Mill

A tour of the East Works of Armco Steel Corp., Middletown, Ohio, was made Sept. 12 by nearly 150 Dayton members and guests. The visitors were impressed by the high safety record and the great effort made by Armco in maintaining that record.

—Robert Bleicher

J. Y. Riedel Addresses Baltimore Meeting

"Improving Production from Tools and Dies" was the program subject at Baltimore chapter's Sept. 7 meeting, with J. Y. Riedel, tool engineer with Bethlehem Steel Co., as featured speaker. He explained and illustrated the most frequent causes of tool and die failures, offering a practical approach toward improving these shortcomings. Slides supplemented his talk.

Speaker at the chapter's meeting last May 4 was Donald E. Wernz, manufacturing research engineer at The Glenn L. Martin Co. and past chairman of Baltimore chapter. He gave an informative lecture on "Aluminum Dip Brazing" which was supplemented with slides.

Fundamentals of this process are simple, and result in smooth, uniformly neat brazed joints which require little, if any, hand-finishing work. Dip brazing lends itself to high-production techniques because multiple joints can be brazed simultaneously, thereby reducing labor costs.

Mr. Wernz is active in national ASTE work as a member of the National Editorial Committee.

—Raymond T. Crew

Battle Creek Speaker Talks on Broaching

Samuel Arvy, chief engineer for Michigan Broach Co., was the technical speaker at Battle Creek's opening meeting of the year, held Sept. 12 at the American Legion. He discussed repair of broach cutters, care of cutters and broaching of stainless steel, titanium and aluminum.

Willard Scott was appointed program chairman, in place of Carl Marietta who has resigned.

—Arthur F. Damon

WESTERN MICHIGAN—A ladies' night program, held at Blythefield Country Club, opened the 1955-56 season on Sept. 20. Featured speaker was Prof. James G. Hays, recently retired from the staff of Michigan State University, who gave an entertaining talk on "Bovine Architecture." About 140 members and wives attended the meeting.

—George A. Lensky

Vascoloy-Ramet Manufacturers of Cemented Carbides

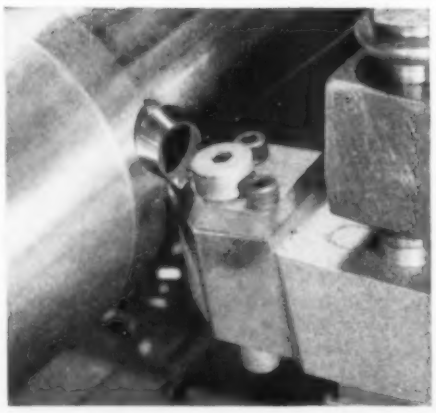
- Blanks
- Single Point Tools
- Boring Tools
- Roller Turner Tools
- Cut-off Tools
- Grooving Tools
- Threading Tools
- Toolholders
- Inserts
- "Throw-Away" Blanks
- Wear Parts
- Carbide Rods & Tubes
- Wire & Rod Drawing Dies

TANTUNG (Cast Alloy)

- Solid Tools
- Tipped Tools
- Cut-Off Blades

And A Complete Line of Tools for the Mining Industry

"You bet I specified V-R TOOLHOLDERS with "Throw-Away" blanks..."



New Exclusive V-R solid cast alloy chipbreaker plate eliminates all ground-in chipbreakers. V-R Toolholders are available with either a standard chipbreaker plate or blank chipbreaker plate that can be easily modified using any grinding wheel.

"They saved us $358.50 a week on one job."

"We have to machine 750 parts a week in our plant.* Our tool cost, using brazed tools for 750 parts, was $397.50 a week. After we changed to V-R Toolholders and "Throw-Away" blanks, the tool cost for the 750 parts was only $39.00. These savings were possible because the initial cost of the cutting edge was so much lower and we eliminated all tool grinding costs. Here is a chart showing these cost comparisons."

	Purchase Price	Grinding Cost	5 Work Pieces Per Edge	Tool Cost per Finished Work Piece	Tool Cost for 750 Parts Per Week
Brazed Tool	$6.11 (1 Cutting Edge)	$4.56 (3 Regrinds)	20 Work Pieces	53¢	$397.50
"Throw-Away" Blanks	$1.58 (6 Cutting Edges)	No Grinding Needed	30 Work Pieces	.052	$39.00
				"Throw-Away" Blanks SAVE	$358.50 a week

An Eastern aircraft engine plant.

These savings are typical of those that can be achieved. Get the facts on this revolutionary new development. Write for information and illustrated catalog on V-R Toolholders and "Throw-Away" blanks.

Vascoloy-Ramet CORPORATION

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

MANUFACTURERS OF CEMENTED CARBIDES • CARBIDE TOOLS AND BLANKS • TOOLHOLDERS AND INSERTS • TANTUNG TOOLS • DIES • MINING TOOLS • INVESTMENT CASTINGS

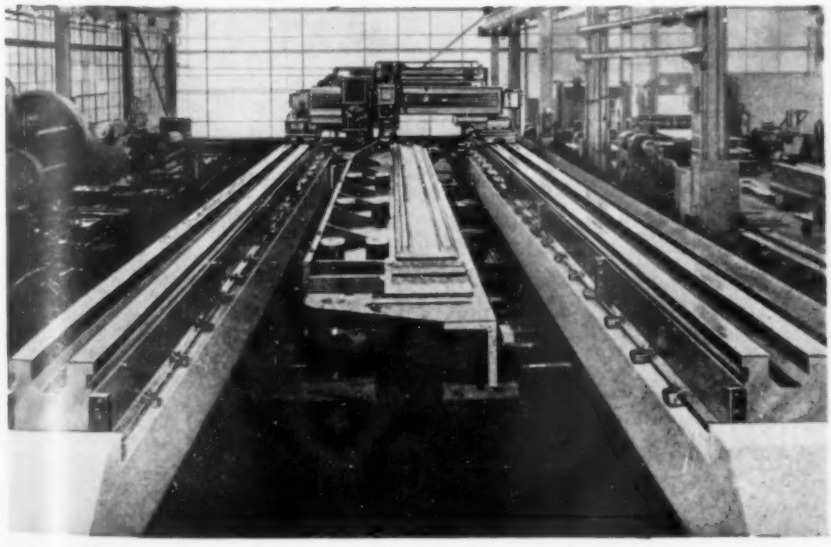
820 MARKET STREET WAUKEGAN, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-146

PROGRESS IN PRODUCTION

MAMMOTH GANTRY TYPE MILL MACHINES COMPONENTS FOR 50,000 TON PRESS

This gantry-type mill, with a work capacity of 17 by 70 ft is capable of taking a cut from the top of a casting the size of a box car with room to spare. Probably the largest capacity milling machine in this country, this hydraulically-driven unit was designed, built and installed by Portland Machine Tool Works. Its first job was machining of the tables and other mammoth components of the 50,000-ton forging press built under the Air Force heavy press program. All milling, boring, and drilling operations on the 60 by 6 by 4-ft die tables were performed on this one machine. Ways of the unit can be indefinitely extended within building limitations to accommodate any length of workpiece. Height variation of the rail traveling along the ways can be accomplished by inserting risers between the rail and the saddles. Incorporated in the machine is a Portland-built 50-hp heavy duty milling head. A tracer controlled hydraulic pressure equalizing system assures accuracy of 0.002 in. parallelism through the 70 ft length of the ways.

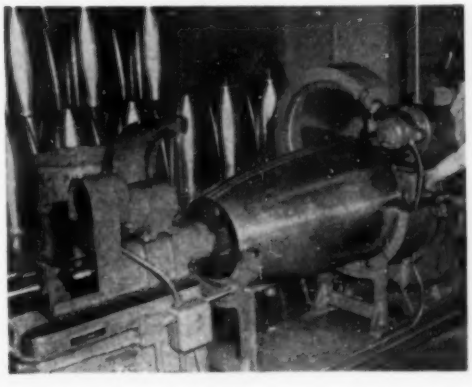


PLANT DESIGNED FOR SEMIAUTOMATIC PRODUCTION

Production of a jettisonable fuel tank every four minutes is the expected rate of output from the recently opened Los Angeles plant of Pastushin Aviation. Designed for maximum production with minimum effort, the facility has utilized semiautomatic special tooling, handling equipment, and gaging and machine controls to reach its production goal.

In full operation, the assembly line uses almost 10 tons of aluminum alloy during an 8-hour shift with about 53 employees in a work area of 50 by 100 ft. Detail fabrication of bulkheads, intercostal and other sheet metal, cast

Operator merely loads and unloads this machine which locates and skin trims both ends of forward section to diameter and length and drills drain holes. Controls are electric-pneumatic.



and forged parts are accomplished outside this area and stockpiled in storerooms adjacent to the assembly line.

Production operation begins when sections are rolled into conical or cylindrical shapes which are conveyed to a line welder that welds the longitudinal seam. After the weld is rolled flat to produce uniform thickness, the center section goes to a subassembly area where bulkheads and internal structures are installed. Tail and nose sections go to bulge forming machines where forming progresses in three operations.

Nose and tail skins are trimmed on special machines which prepare the surface for subsequent joining of other sections. Sheet metal spinnings for nose and tail cones reach the line at this point to be joined to the nose and aft sections by automatic heliarc welding machines.

Two special welding machines join center and aft sections for the critical operation that determines the four-minute assembly cycle. After this, a pressure check is the final operation. Tanks are then crated on another conveyor line and carried away.

Engineering and production departments, working closely as a team have combined creative and production ability and physical plant facilities to develop this integrated manufacturing technique.

Right. Aft cap is welded to aft skin. All operations, including welding feeds are controlled electrically or pneumatically. Approximately six hand welders are replaced by this process.

Skin is being formed on forward skin bulge form machine. Sixteen segments expand to give the desired shape. Operation takes only two minutes floor-to-floor time.

Remember this at the Coliseum Machinery Show?

Write for Detailed Bulletins *Right Now* on the Metal Working Machines in which You Are Interested.

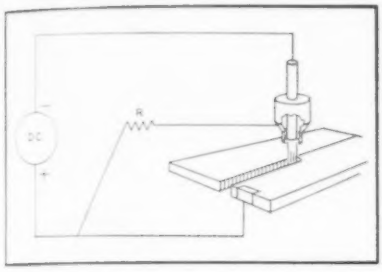
BROS. ENGINEERING WORKS
1320 N. Kostner Ave., Chicago 51, Illinois

Export Distributor: Simmons Machine Tool Corp., 50 E. 42nd Street, New York 17, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-148

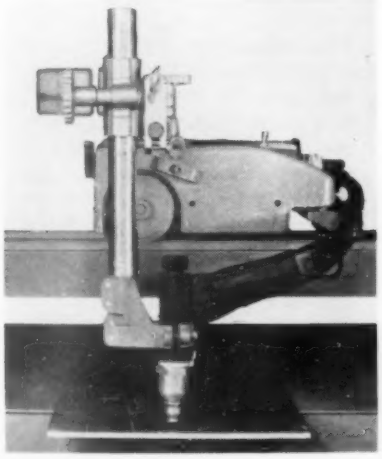
SHAPE NONFERROUS METAL BY ARC-CUTTING PROCESS

Techniques for fabricating nonferrous metals may be altered by a process utilizing Heliarc cutting developed by Linde Air Products Co., a division of Union Carbide and Carbon Corp. The new method uses a gas shielded arc for cutting, it offers a means for shaping nonferrous metals which is equivalent to oxygen cutting on steel. Among its major advantages is that Heliarc cutting is adaptable to either mechanized or manual operation. Past methods,



Above. Schematic diagram of Heliarc cutting, altered from normal conditions by addition of pilot-arc circuit and gas nozzle construction.

Below. Equipment ready for use.



too, have been limited generally to straight-line cuts, while this cutting technique is capable of making any irregular or curved shape. Used either manually or mechanically, the method operates successfully in any position.

Speed and quality of manual cutting vary according to the operator's skill. Average speed is about 60 ipm on ½-in. aluminum plate. The kerf edges of all cuts have a saw-like quality with square corners and no attached dross.

In cutting aluminum, normal mechanized cutting speeds are 300 ipm in ¼-in. material, 125 ipm in ½-in. metal, 75 ipm in ¾-in. plate and 50 ipm in 1-in. material. Lower cutting speeds too can be obtained simply by adjustment of the controls.

EASY to READ in any light —
reduce errors, speed up readings.

RESIST RUST and STAINS —
from oils, acids, perspiration.

WEAR LONGER —
multiple electroplatings protect markings, resist abrasion.

LUFKIN

CHROME CLAD
STEEL RULES

Ask your industrial distributor to show you the new Lufkin machine divided Steel Rules with the famous Chrome Clad finish. Jet black "rapid reading" markings stand out sharp and clear against the hard chrome white background. Available with all popular graduations and in all popular lengths — both full flexible and spring tempered.

BUY LUFKIN TAPES • RULES • PRECISION TOOLS FROM YOUR DISTRIBUTOR

THE LUFKIN RULE COMPANY, SAGINAW, MICH.
132-138 Lafayette St. New York City
Barrie, Ont.

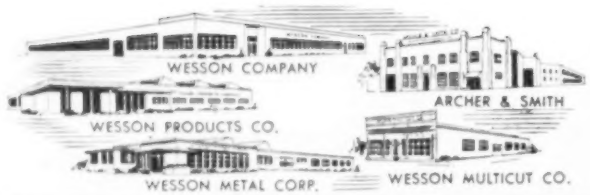
372

SAVE TIME

CONSULT YOUR INDUSTRIAL DISTRIBUTOR

- He can supply most items immediately from his stock.
- His knowledge of new tools and methods will help you operate at peak efficiency.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-149



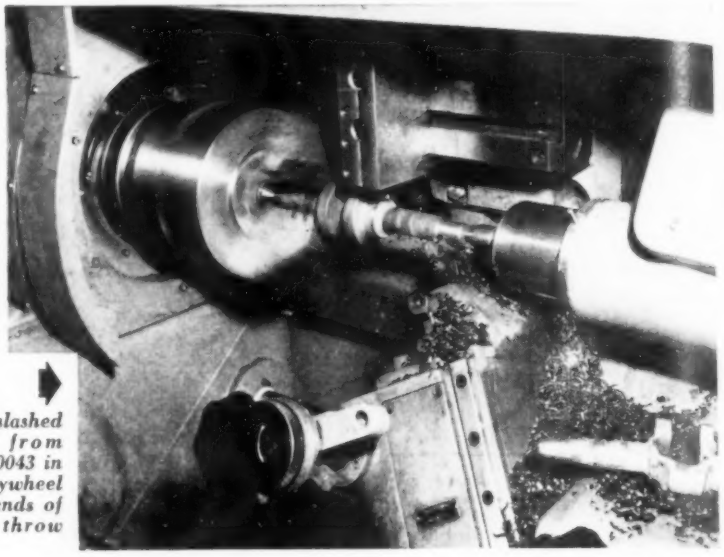
carbide NEWS

Grade 26 Cuts Tool Costs 88%

New wide range grade and holder boost pieces/grind from 85 to 800

A reduction from approximately four cents to less than ½ cent per piece in tool cost has been achieved in the machining of single-throw Arma Steel crankshafts by a midwestern machine company. These savings were obtained despite an increase in blade cost of 41% over the style previously used.

The savings were achieved in two steps. The first revealed that Wessonmetal Grade 26 would out-perform all other grades by an average of 50 pieces per cutting edge. The next step was to adopt a Wesson Multicut holder. This helped to increase tool life to 200 pieces per cutting edge. With four edges per insert, life is 800 pieces per grind, as against the original 85. Part of the overall increase is due of course to the rigid construction and support provided by the new holders.



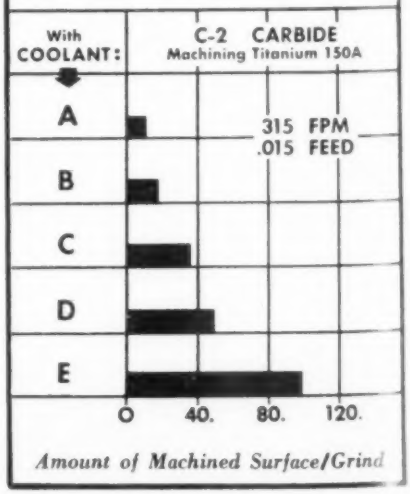
26 Carbide slashed tool cost from $0.038 to $0.0043 in machining flywheel and pulley ends of this single throw crankshaft.

Operations consist of rough and finish turning of the flywheel and pulley ends of the 220 Brinell steel crankshaft. Machining is being done dry on a 20 hp New Britain tracer lathe at 1210 rpm and .014" feed. Depth of cut averages ¼ to ⅜-inch.

In achieving the savings, no changes were made in speeds, feeds or depths of cut.

Tool Hints . . .

The cost-cutting story told above re-emphasizes the necessity of studying ALL the factors contributing to tool performance if maximum economies are to be obtained. In this case, the answers lay in (a) the carbide metal and (b) the tool holder. Sometimes it may be the coolant which will provide a major saving. In the chart below, for instance, are shown relative lives of the same tool material at the same speeds and feeds using five different types of coolant in the machining of Titanium 150A! A C-2 grade of carbide was used and feed was .015" at 315 ft. per minute.



New Carbide Research Center

New concepts in carbide boring and milling cutter designs may result from new research programs now under way at Wesson. Included are milling cutters utilizing "throwaway" carbide blades.

To house Wesson's expanded product development and tool application research facilities and staff, a new one-story structure has been completed adjacent to Wesson's Detroit plant.

The new research division will supplement the basic metals research carried on in Lexington, Kentucky at the new metals plant of the Wesson Metal Corporation, now producing all Wessonmetal carbides.

The new research division is under W. B. Bader, Vice President. It is being completely equipped for fabrication as well as testing of new tool designs. Lathes, milling machines, grinders, etc., are included in the equipment.

tools Wesson carbide Wessonmetal

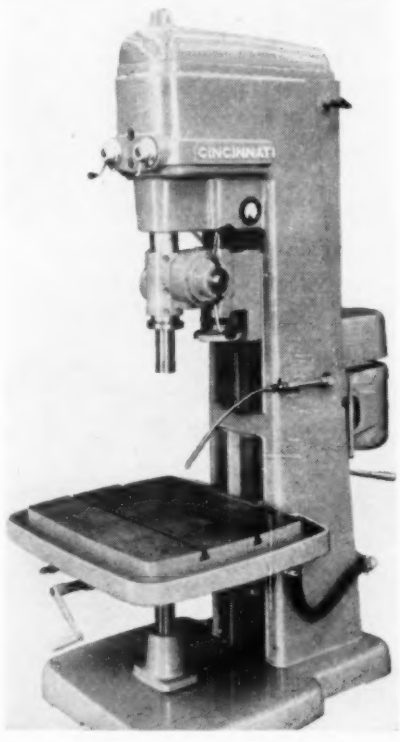
WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

TOOLS of today

Drill Units

The 21-in. sliding head floor drills announced by Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio, feature conveniently located, built-in elements for operator comfort and modern appearance. They are available with a box or round column, and box column machines are offered in multispindle arrangements.

Easier drilling and higher production are accomplished by the geared power feed supplied for the drills as standard equipment. A simple selector obtains any of four rates of feed which are engaged through a positive-jaw clutch. The entire power feed mechanism is built in and completely housed in the head.



Tapered roller and ball bearings, in which the spindle is mounted, take radial and thrust loads. The motor is accessibly mounted to the rear of the drill, and spindle speed changes are easy because of the tilting motor bracket.

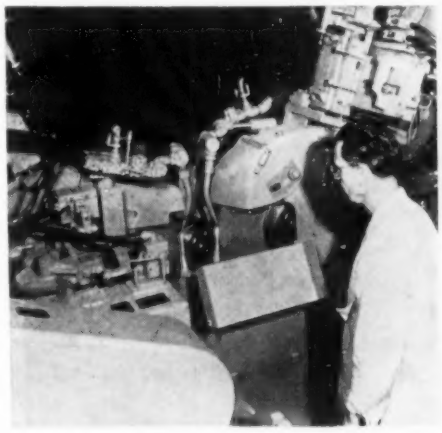
Drills are rated at 1½ in. in cast iron with a 2 or 3-hp, 1800 or 1500-rpm motor. A No. 4 Morse taper spindle is standard. A No. 3 Morse taper spindle is optional if specified.

The drills are shipped complete with motor and controls, preventing installation delays. A fully enclosed electrical panel is built into the drill. An interlock built into the door of the panel prevents opening unless the disconnect switch is in the "off" position. A transformer is supplied with all machines operating on 220 volts or over to reduce voltage at the push-button station to 110 volts—a new operator safety feature. **T-11-1511**

Special-Purpose Grinder

Norton Co., Worcester 6, Mass., has announced the Type GMS-1 semiautomatic multiwheelslide cylindrical grinding machine, a special-purpose grinder which can be adapted to a wide range of cylindrical grinding operations. Principal advantage of the machine is its ability to plunge grind multiple diameters simultaneously on workpieces which, because of their shape, do no lend themselves to grinding on conventional multiwheel machines. Design permits savings in both setup and grinding time.

Sturdy, unitized wheelslides, positioned during manufacture for requirements of a specific job, may be opposed or placed in line. Slight angular or lateral adjustment of position for setup purposes is by means of an independent auxiliary control. Each wheelslide mounts one or more 30-in. diameter grinding wheels according to job requirements. The type of workholding equipment furnished also depends on the job. Chucking arrangements on a single work head, or equipment for holding the work on centers, can be supplied.



Two-rate automatic feed assures optimum conditions for rapid stock removal, workpiece accuracy and finish. Convenient wheel feed handwheels with "click-count" indexing mechanisms adjustable in increments of tenths without visual attention, simplify size con-

trol in setup and initial operation. There also is individual push-button operated jogging control of wheelslide movement.

Automatic wheel truing is by wheel guard type devices which operate consistently at predetermined speed and feed. Compensation of wheelside setting for the amount of wheel diameter reduction after truing is automatic.

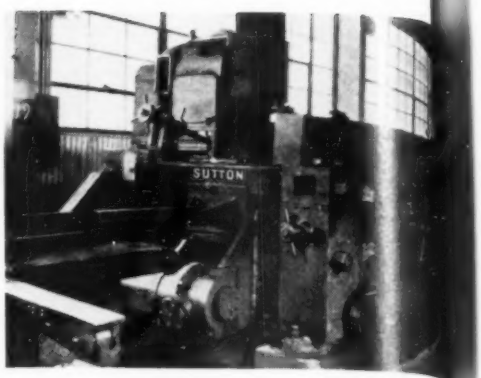
T-11-1521

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Straightener and Polisher

The Model 1½FX straightener has been developed by Sutton Engineering Co., First National Bank Bldg., Pittsburgh 22, Pa., to polish as it straightens bars and tubes at high production speeds.

In a typical application at Pilgrim Drawn Steel Div. of Automotive Materials Corp., the new machine straightens and polishes cold drawn steel bars from 5/16 to 2½-in. diam at speeds up to 300 fpm. It can straighten a variety of grades such as high and low carbons, Bessemer grades and alloys. Concentricity is controlled by the machine



as it gives the finished bars a bright, smooth finish. Size tolerance also can be controlled by raising or lowering the diameter of the bar, depending on the analysis of the grade being straightened.

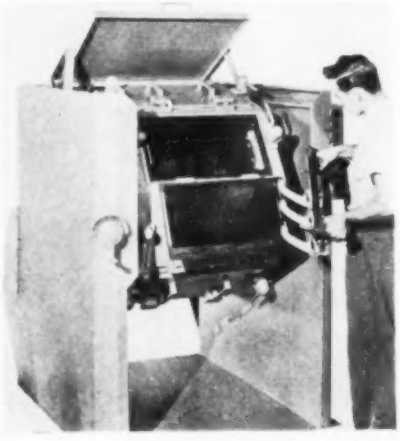
In the machine design, a modification of the 5-roll principle of straightening is employed. Bars or tubes are fed through a horizontal pass line in which two large rolls are opposed by three smaller rolls. While normally only two of the five rolls are driven, this 1½FX Model has four driven rolls to provide a burnishing action.

Power is provided by a 30/40 hp, 400/1600 rpm, 230 volt, adjustable-speed d-c motor. All controls are readily accessible and change-over from one size to another is simple and fast. Antifriction bearings are used throughout. Floor space is conserved by the top-mounting of motor. **T-11-1522**

Finishing Machine

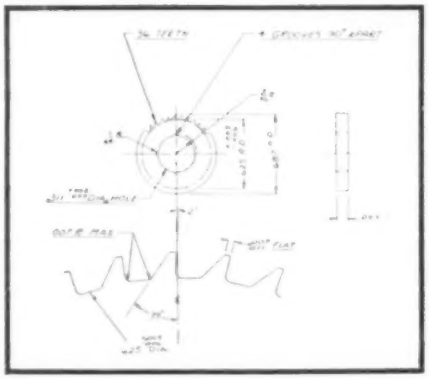
An 8-door stationary-fixture finishing machine, designed primarily for coloring of aluminum castings is announced by Roto-Finish Co., Kalamazoo, Mich.

The machine has a door on each flat of a single compartment cylinder. Fixture pads are attached to the octa-



Gaertner OPTICAL INSTRUMENTATION

to measure and check parts like this



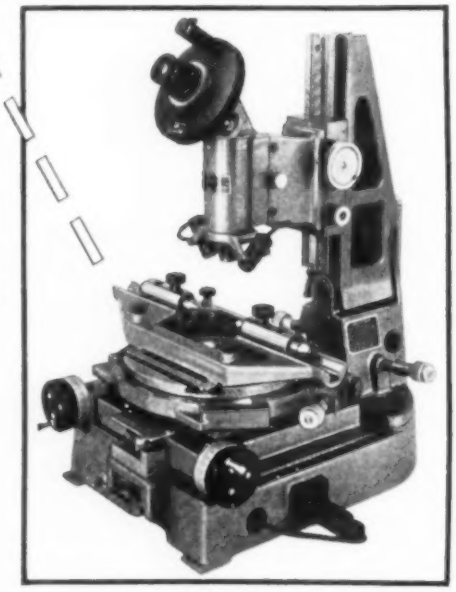
Use the Gaertner Toolmakers' Microscope

FEATURING

Range	2" x 4"
Reading to	.0001"
Stage Rotation	360°
Reading to	1 minute
Magnification	30X
Protractor Ocular	

ACCESSORIES

Templet Ocular Head
Radius and Thread Templets
Camera Attachment



M2001ARS

Write for Bulletin No. 147-50

The Gaertner Scientific Corporation
1241 WRIGHTWOOD AVENUE CHICAGO 14, ILLINOIS
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-152

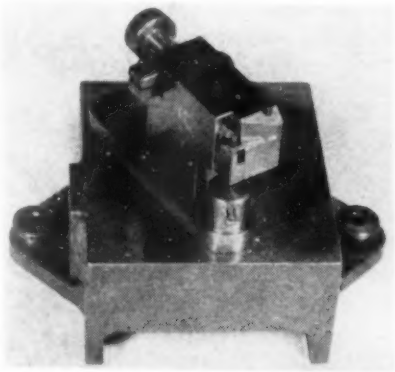
side walls of the compartment just inside the door opening. After fixture is placed inside the cylinder, it is held in position during the processing operation by attached pads and by pressure of the closed door pushing it firmly into the contoured pad. Fixtured parts are held by the fixture grids to effectively expose them to processing media. It is not necessary to remove processing media or solution when removing work load from the compartment.

Processing compartments vary in size up to 48 in. long and 42 in. in diameter. For average processing the company recommended size is a compartment 32 in. long and 42 in. in diameter. This size, used for coloring aluminum castings with steel balls, has a 7½-hp drive equipped with automatic reversing electric controls.

Doors are hinged for rapid servicing of fixtured parts resulting in economical operation. **T-11-1531**

Pointing Fixture

A crankshaft drill point grinding fixture for drill sizes from No. 50 through 3/32 in., which permits accurate work at a rate of 300 drills per hour, is available from Schumacher Industries, 15500 Surrey, Livonia, Mich.



This crankshaft point is well suited for deep hole drilling and for drilling stainless and tough allow materials. It is also useful in the aircraft industry for drilling aluminum, stainless and heat-treated parts. **T-11-1532**

Welding Positioner

The Weldma Co., 63 LaSalle Rd., West Hartford, Conn., has developed a precision circumferential welding positioner of 4000-lb capacity.

The positioner frame, mounted on grooved casters, is designed for maximum strength and rigidity, while a

Ahead Where?

You will see more and more of VULCAN Tool Steels in the near future. They are coming closer through VULCAN's "forward motion," including expanded district office and warehouse outlets.

Thus you will gain access to the special advantages VULCAN Tool Steels offer—to help you produce your finest tools and dies.

VULCAN offers only the finest tool steels—*forged* to assure highest quality.

VULCAN's moderate size and specialization give you close attention to your exact needs. Service is efficient and prompt.

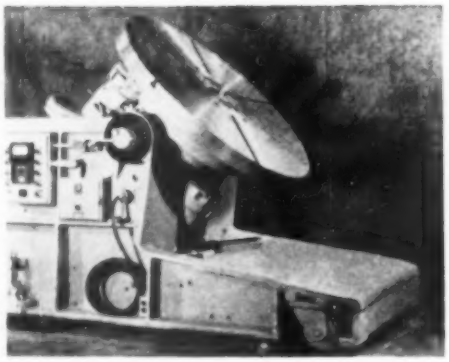
VULCAN Tool Steels are available in all types, shapes and sizes. See your VULCAN representative, or write for VULCAN Tool Steel Data.

Vulcan Crucible Steel Co. Division

HKP

H. K. PORTER COMPANY, INC.
Aliquippa, Pennsylvania
Offices in Pittsburgh, New York, Baltimore, Boston, Chicago, Birmingham, Milwaukee, St. Louis, Lansing

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-153

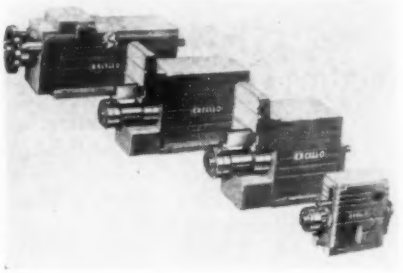


diameter-keyed face plate is set in a large bearing to avoid drag. Drive is by a gear motor. Smooth and constant power transmission is achieved from a work gear and worm wheel mechanism. Performance tests indicate maximum speed variation of 1.00 percent at low-speed regulation and 0.50 percent at high-speed regulation. Acceleration or deceleration from zero to maximum speed or reverse is adjustable to 2 seconds. Variable-speed regulation at a 100:1 ratio from zero to 2 rpm is electronically controlled and readily adjusted at a centrally located control panel. Helical-segment gears and tilting mechanism assure accurate and positive angular adjustments up to 105 deg. The positioners also may be operated by a remote control switch. Indicator gages, which record faceplate speed and degree of angular tilt, are located in the central control panel.

The precision and rigidity of the equipment suggests, also, supplement uses such as boring and milling oper tions and additional manufacturi processes wherever exact and careful controlled positioning is required. Po er operating indexing equipment available for use when the position is utilized for boring and milling ope ations or other manufacturing pro esses. In such cases, variable speed re ulation is eliminated. **T-11-154**

Hydraulic Power Units

Automatic cycles for production machines are supplied by new models of the quill type hydraulic power units made by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. These models, which incorporate step-drilling equipment, are also used for feeding



and rotating cutting tools or driving multiple spindle heads, and are particularly suited to automatic drilling, reaming, counterboring and spot-facing.

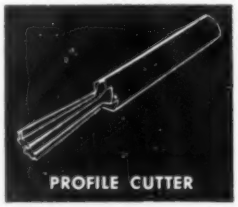
These versatile power units permit easy arranging of machining cycles and provide a wide range of feed rates. Several units may be used on a single base for multiple operations. Controls can be set for simultaneous or successive operations. **T-11-1542**

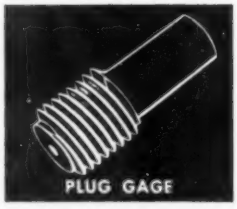
Stock Feeder

The stock feeder made by Roll-O-Matic Industries, 18533 Weaver, Detroit 28, Mich., provides for reloading a multiple-spindle screw machine without stopping the machine each time the previously fed stock is used up. Thus, it is possible for one man to easily operate a number of such machines.

The feeder includes a pair of rollers which engage the stock and feed it to a screw machine spindle which is aligned with the rollers. The rollers are disengaged from the stock before the machine indexes to its next position.

By their manner of rotation, the rollers feed additional length of stock to the spindle and can feed out more than three times the length for which the





Sentry Furnaces *Eliminate* Costly Tool Spoilage

Complete protection from scale and decarburization during the heat treating cycle is essential on tools similar to the milling cutter shown above.

Heat treating of expensive tools of high speed and air hardening steels calls for utmost reliability in heat treating equipment. Sentry Furnaces, with the Diamond Block Method of atmosphere control, have given hundreds of manufacturers this reliability, at the same time saving them money by eliminating costly tool spoilage.

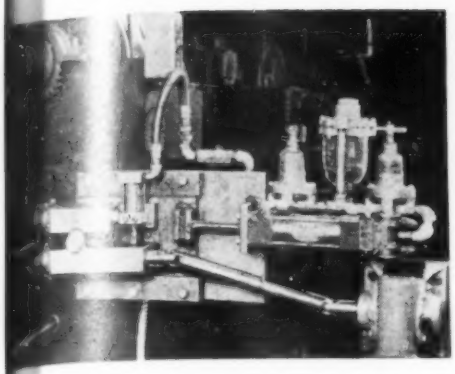
Whatever tools your Heat Treating Department is concerned with — files, reamers, taps, dies, form tools — only Sentry will heat treat them with the reliability and efficiency so essential to expensive items.

Make sure the right furnace — Sentry — is in your tool hardening or heat treating picture.

Request Catalog E-46
Tells the full story of Sentry Furnaces and The Sentry Diamond Block Method.

Sentry ELECTRIC FURNACES
THE SENTRY CO. • FOXBORO • MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-154



machine is designed.

New bar stock may be easily fed to the spindle without interrupting the continued operation of the machine simply by introducing it between the rollers. A special swing stop feature moves into a position to catch the end of the used bar as it drops out of the collet, allowing enough stock for face off.

The stock-feeding apparatus is simple in construction, quickly and easily installed and reliable in operation. It may be mounted on most machines of the multiple spindle type. Feed fingers and tubes which are normally provided on the spindles are not needed. **T-11-1551**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Abrasive Cutoff Machine

A semiautomatic abrasive cutoff machine, which may be used wet or dry, is designed to provide accuracy, good finish and operator safety. The cutoff wheel is entirely enclosed, during the upward cutting stroke, by a metal safety cover. Dual hydraulic clamping plates hold the material rigid on both sides of the cut, while wheel travel, clamping plates and wheel cover are all operated by hydraulic cylinders.

In wet cutting, coolant flows through the wheel shaft, thus cooling the bearings, and is applied to both sides of the wheel through openings in the wheel flanges.

A special heavy-duty motor and drive unit combination has a flywheel effect that keeps wheel speeds constant up to the maximum 13,500 sfpm. The machine cuts solids up to 2½ in. in diameter, squares to 1¾ in., angles to 4 in., and tubing up to 4 in., OD.

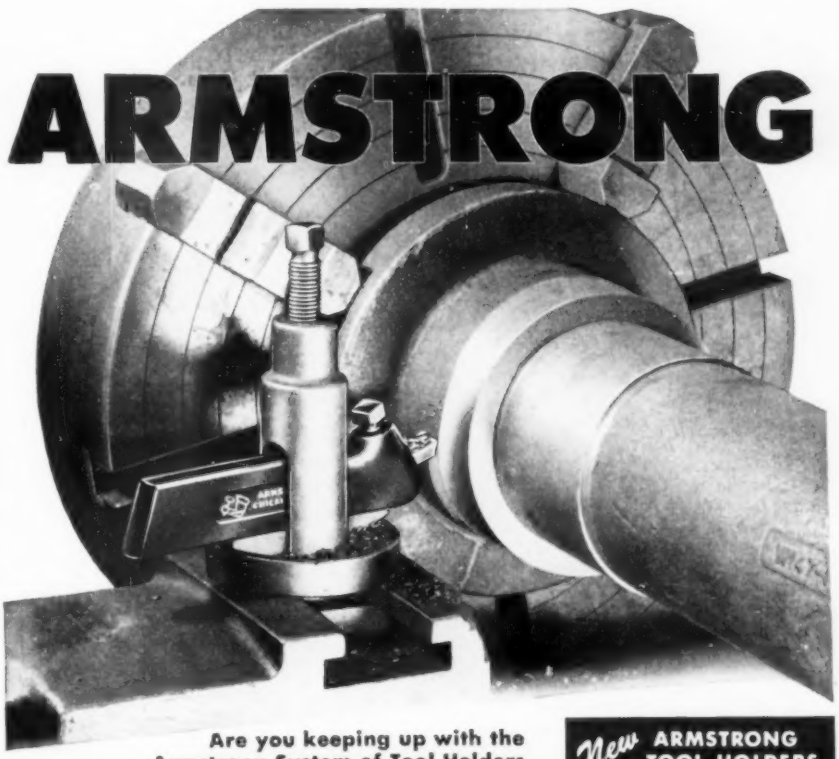
Sales and service are handled by both the Lombard Governor Corp., Ashland, Mass. and the manufacturer, George H. Bullard Co., Westboro, Mass.

T-11-1552

Indicating Bench Micrometer

An unusual indicating bench micrometer with nonrot ting spindle is introduced by the George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. Particularly useful for maintaining close limits on small work, it provides an aid for fine small-parts measurements, such as instruments, parts, wires, screw machine parts, etc. for the toolmaking, instrument making or electronic field. Spindle and anvil have bores for holding different shapes of measuring spindles.

Measurements can be read directly to 0.0001 in. from the oversize micrometer thimble, which is 1¾ in. in diameter and guarantees accurate reading without a magnifier. The indicating



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

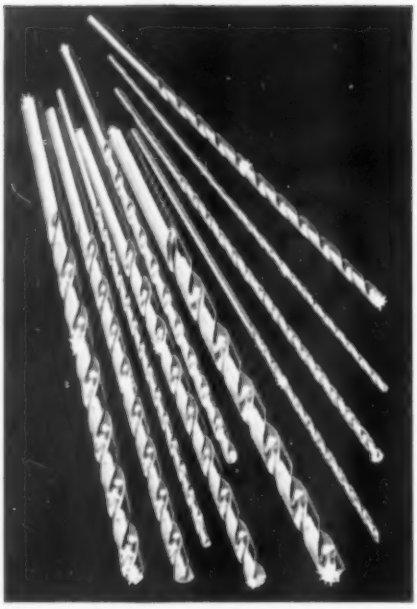
If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

ARMSTRONG BROS. TOOL CO. "The Tool Holder People" 5251 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-155



Now! Drill deep holes without costly "Specials"!

ACE

12" LONGBOY DRILLS

If you've been investing a lot of money in "specials" for deep hole drilling operations, then here's good news for you! Ace Drill Distributors now carry, *in standard stock*, a complete line of 12" Longboy drills . . . ready for immediate delivery! And, in many instances, you'll find that an Ace Longboy can be a big *improvement* over a costly "special"! The polished flutes are precision ground into a properly hardened high speed steel bar. This makes possible a finer finish and keener cutting lips. And the result? Greater production, longer tool life, lower operating costs. Call your local distributor . . . or send for complete information today!

ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-B containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

INDICATE A-11-156-1

head is graduated in 0.00005 in. divisions with a plus and minus 0.002-in range.

As a comparator, the unit may be set without additional standards. A cable release retracts the anvil for rapid repeat measurements. Adjustment screw outside of housing adjusts for zero, while two tolerance hands may be quickly adjusted to any predetermined plus and minus tolerance. **T-11-1561**

Rotary Table With Control Device

A 42-in. precision rotary table, introduced by Pratt & Whitney Co., Inc., West Hartford, Conn., makes automatic programming available for circular spacing, inspecting, calibrating and machining. This unit is similar in mechanical design to the company's earlier 42-in. plain rotary table.

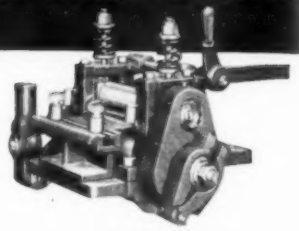
Spacing with the table is accurate to seconds of arc. Indexing dogs may be located as close as 3 deg. In operation, after the index points have been established, push of the "cycle start" button initiates automatic indexing. Each point is located by dogs electromagnetically without making physical contact.

Four speeds are used in the indexing cycle. A cycle of 30-deg arc is completed in approximately 6 sec. **T-11-1562**

Optical Contour Grinder

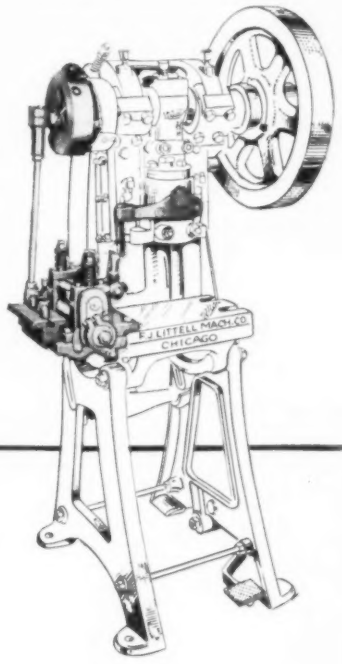
Profile ground shapes are produced directly from either a line drawing or duplicate finished ground profiles by the optical control grinder developed by Jones & Lamson Machine Co., Springfield, Vt.

AUTOMATION on your present punch press is easily obtained



with the

LITTELL Style "M" ROLL FEED



your press is tooled for AUTOMATION at lowest cost

Write for the Littell Roll Feed Catalog today

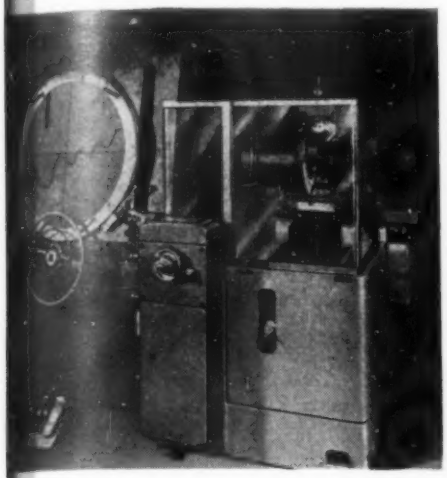
F.J. LITTELL MACHINE CO.

4199 N. Ravenswood Ave., Chicago 13, Ill.

INDICATE A-11-156-2

new unit is a surface grinder with hydraulic tracer control coupled with a 30-in. screen comparator arrangement for visual and manual control of the grinding wheel from a contour chart.

The screen has a precision optical projection system which gives the projected image maximum brilliance and constant focus. Three quick-change precision lens systems provide 5, 10 and 20X magnification with a 6, 3 and 1½-in. diameter field, respectively. The



unit offers large optical and machine capacity. The prime machine components are precision-controlled on preloaded roller slides. Length and speed of worktable stroke are adjustable.

A workpiece is mounted on the comparator screen together with an equally enlarged representation of the cross section form of the grinding wheel cutting edge. Convenient controls permit the operator to advance the grinding wheel along the work contour. The projected image, representing the cutting edge, is simply made to follow the outline chart mounted on the comparator screen. Control during the automatic lateral grinding wheel feed and continuous table reciprocation is by a single handwheel.

The grinding wheel can also be template controlled by master stylus and hydraulic tracer.

Work first produced by manual and comparator control can in turn be reproduced in quantity by automatic tracer control. **T-11-1571**

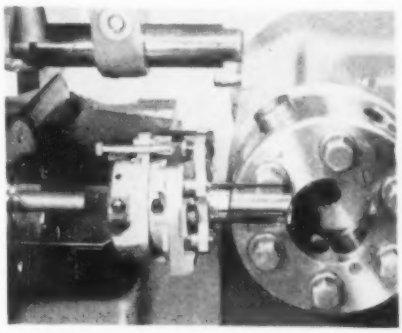
Cutoff Wheels

A complete, B7 bond line of Aloxite aluminum oxide resinoid cutoff wheels announced by Bonded Abrasives Div., The Carborundum Co., Niagara Falls, N. Y., combines qualities essential to dry production metal cutoff operations. Because of the characteristics of the B7 bond, the wheels produce a fast, cool cut. A special process in the manufacture results in sharp sides on all wheels to prevent binding in the cut.

Three grades of the new line are available: "R" for operations that require minimum burn and burr; "T" for general purpose work where some burn and burring is acceptable; and "V" for rough work where maximum wheel life is the most important factor. Wheel sizes range from 6 to 20 in. in diameter and $\frac{1}{16}$, $\frac{3}{32}$ and $\frac{1}{8}$ in. thick. Metal bushings are supplied on all arbor holes in the range of $\frac{5}{8}$ to $1\frac{3}{8}$ in. All wheels are available in 24 to 120 grit. Intermediate grade action can be obtained by grit selections within this range. **T-11-1572**

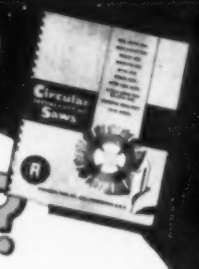
Aligning Bushing

An attachment specifically designed to assure proper alignment between spindle and toolholder when using cutting tools such as taps, drills, reamers, boring bars and die heads, is an-

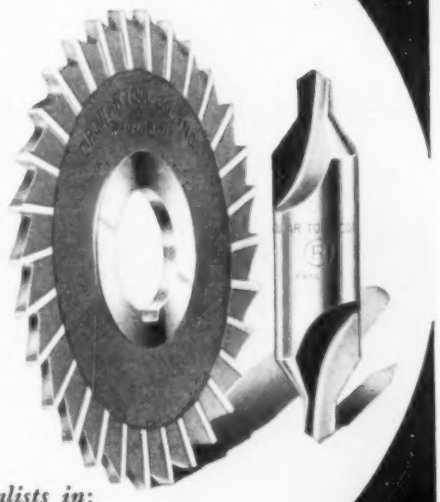


Have you seen

Our NEW CATALOG N?



In our definitive new catalog you'll find Circle R products pictured and fully described, with size and price listings, ordering instructions, and helpful data on speeds and feeds for most effective metal cutting. As specialists, we make nothing but circular metal cutting tools — the finest you can buy, though they cost no more. We are consultants on metal-cutting problems throughout industry, with particular reference to the new problems of automation. Ask for your free reference copy of Catalog N. Write direct or contact our Circle R Specialists in your district.



... Consult CIRCLE R Specialists in:

SUPREME QUALITY R 1923 - 1955

BURBANK, CHICAGO, CLEVELAND, DAYTON, DETROIT, INDIANAPOLIS, KANSAS CITY, MILWAUKEE, NEW YORK CITY, PHILADELPHIA, MONTREAL, PHOENIX, PITTSBURGH, PROVIDENCE, ROCHESTER, ST. LOUIS

CIRCULAR TOOL CO., INC.

PROVIDENCE 5, RHODE ISLAND

Specialists in Circular Cutting Tools Since 1923

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-157

nounced by Jones & Lamson Machine Co., Springfield, Vt.

The unit consists of two eccentric bushings, one fitting inside the other. Both bushings are graduated on a harmonic scale and calibrated in thousandths.

The exact amount of machine misalignment is easily compensated for through one simple, accurate setting using the calibrations on the bushings.

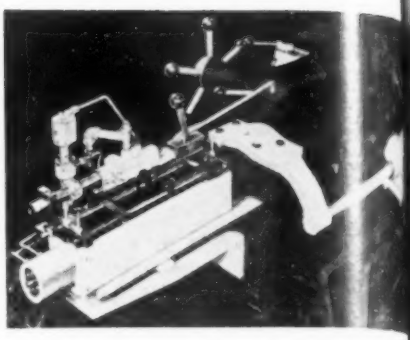
Sizes range from $\frac{5}{8}$ to 1-in. OD.

T-11-1581

Turret Drive for Lathe

A low-cost hydraulic turret drive for modernizing hand turret lathes is introduced by the A. W. Cash Co., P. O. Box 551, Decatur, Ill.

Quickly and easily adapted to standard ram type turret lathe, Nos. 1, 2, 3, 4 and 5, the new drive permits increased production and reduced costs because, with it, there is no need for hand indexing and traversing. Designed to reduce fatigue and save time



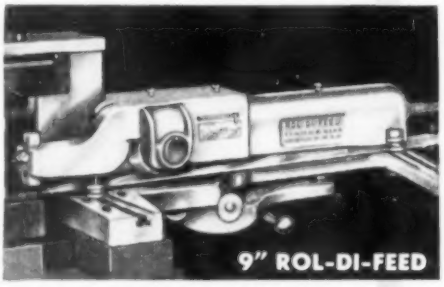
on short and long-run work, it reduces the number of rejects, and increases tool life.

Any mechanic can set up and operate the drive. The cycle is started with a hand control valve. The master valve then controls the required operations in a preselected sequence, leaving the operator free to inspect and to prepare the next piece for chucking. **T-11-1582**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Tap Grinder

A unit equipped with automatic work handling was specifically designed by Jones & Lamson Machine Co., Springfield, Vt., for high production grinding of standard taps. An important feature is the wide range of work speeds available specifically for effective grinding conditions on all tap sizes from 0 to $\frac{5}{8}$ in. in diam. Individual lead screws for each pitch have $\frac{1}{8}$ the pitch of the thread being ground, insuring long lead screw life.



* 24 hours per day for 3 years — production over 70 million pieces.

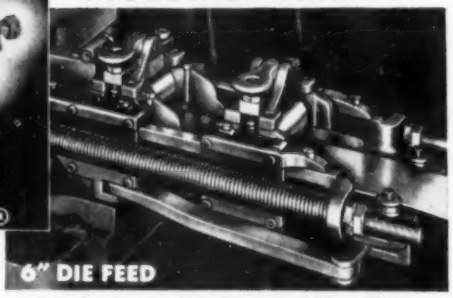
TOP PRODUCTION every minute . . . of every day!

NO HAND FEEDING FATIGUE . . .
NO AFTER LUNCH LET DOWN . . .

with Dickerman automatic punch press feeds!

These Are Actual Production Facts . . .

* Feeds .020" cold rolled steel at 336 strokes per minute — over 160,000 pieces per 8 hour day.



* 3 feeds produced over 100 million pieces in less than a year.

Dickerman

H. E. DICKERMAN MFG. CO.

324-262 Albany St. • Springfield, Mass.

*Actual users names furnished on request.

12 standard feeds can be shipped from stock to solve your immediate problems. Send for literature today!

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-158

Grinding cycles are held constant and uniform during rapid wheel advance, and depths of cut and rapid withdrawal are positively controlled through a simple cam action.

Wheel turning is automatic before and after a finish cut and is counter controlled when more than one piece is ground per dressing. Wheel sizes are 20, 18 or 15 in.

Automatic, positive size control is assured because the wheel slide is held against a positive stop with uniform hydraulic pressure.

The machine has provision for multiple cuts. **T-11-1591**

Motor Speed Control

Electric Regulator Corp., Pearl St., Norwalk, Conn., has developed a line of d-c motor-speed controls. Characteristics of the units are compactness, reliability and low cost. They are designed to deliver stepless motor-speed control from 'dead stop' to 'above base speed.' Motor speed is set by the operator and thereafter constant within 2 percent in spite of line and load variations.

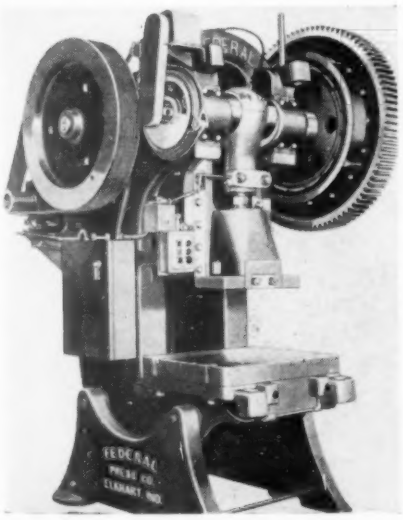
Standard features such as dynamic breaking, reversing, etc., are available. No electronic tubes are used in these controls.

These controls are unusually sensitive, have the ability to withstand rough handling and offer long maintenance-free life. **T-11-1592**

Press

Federal Press Co., Elkhart, Ind., has introduced its 100-ton #8 air clutch press.

Feature of this unit is its precision operation at higher speeds with maximum safety as a result of an air-



ACCO products

Wilson "Rockwell"* Hardness Testers

EASY TO USE as a scale

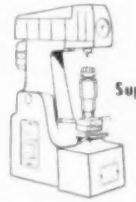
SENSITIVE & ACCURATE as a precision balance

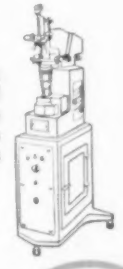
DURABLE as a machine tool

3-JR MODEL
Invaluable for tool room use and most production testing

Fully Automatic

Semi-Automatic


Superficial


Tukon Micro and Macro Hardness Testers

• WILSON "Rockwell" Hardness Testers were the first to combine in one high grade instrument the precision and sensitivity demanded in the metallurgical laboratory, the accuracy required in the tool room *plus* the ease of operation and durability for daily use on the production line.

Now the world's standard of accurate hardness tests since 1921, WILSON "Rockwell" Hardness Testers have developed to keep pace with the ever-expanding requirements of industry. Their testing scope and capacity has increased until their use in steel mills, non-ferrous mills and metal fabricating plants is universal.

A staff of WILSON hardness-testing experts is conveniently located to check your needs with you—recommend just the size and model best suited to the job. Why not call or write today?

*Trade mark registered

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-H Park Avenue, New York 17, N. Y.

for Better Value

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-159

actuated clutch and its electropneumatic control. Twin solenoid valves provide extra safety, while a system of lights on the control panel signals the operator that the press is in safe operating condition.

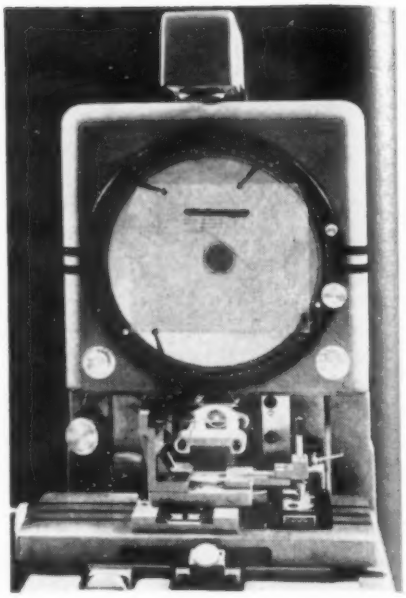
Operation of the press is simple and requires a minimum of effort. The electropneumatic control permits instantaneous fingertip starting and stopping. The press may be single-tripped, either by hand or foot control, inched, or operated continuously.

T-11-1601

Tracers for Optical Gaging

Parts which are unusually difficult for optical inspection now may be accurately gaged by reticle tracing fixtures introduced by Optical Gaging Products, Inc., 26 Forbes St., Rochester, N. Y.

By using the tracing principle, the part itself need not be projected; only an actual size outline of the part, with tolerances, appears on the comparator screen. This outline is reproduced on clear glass and projected on the comparator screen. A tracer stylus, linked



rigidly to the reproduction (reticle) moves over all configurations of the part to be inspected.

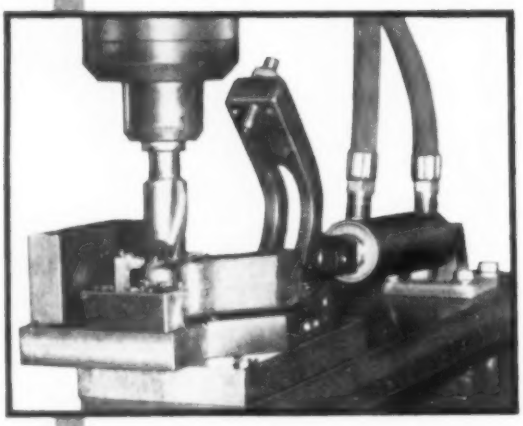
Principal advantage of the new tracer is that projection is independent of part size, and that any desired magnification can be used on the projector.

Four standard reticle tracer units are being introduced. **T-11-1602**

LODDING

pioneers a new era in work-holding

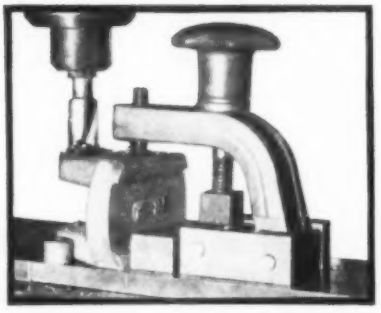
RETRACTING CLAMPS



Air Automation

As fast as air, as rigid as a bar of forged steel. Lodding's new Retracting Clamp is self-retracting and adaptable to all work. Four sizes, four types.

For rapid hand clamping, too. Quick as a flick of the wrist, a quarter turn of the screw, and a natural arm movement brings clamp to work and clamps — another quick movement releases work and retracts clamp.



Available with hand knob, cam or nut.

Factory Warehouse

Precision Tool Sales, 417 E. Florence Ave., Los Angeles 3 — PL 3-3321

LODDING, Inc.

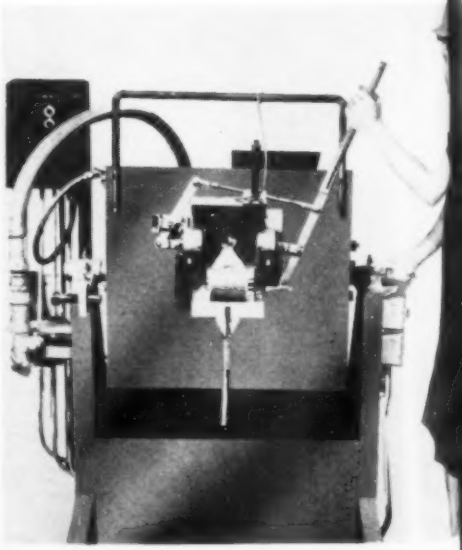
WORCESTER 1, MASS.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-160

Metal Castings Units

A gravity casting machine, called Grav-O-Matic, which permits manufacturers to do their permanent mold castings economically in their own plants, is announced by Automation-Engineering Corp., 1127 Wilshire Blvd., Los Angeles 17, Calif.

The automatic machine produces high-quality permanent mold castings



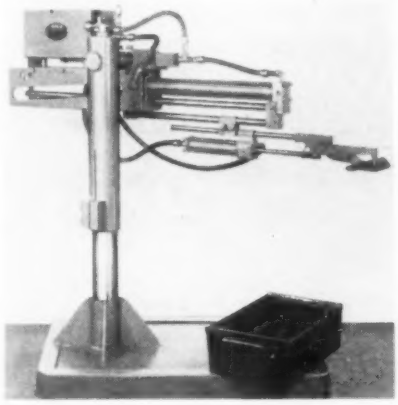
ppreciable unit cost saving. The olled "in your plant" operation inates large inventories often nec- y when using outside foundries as ource of supply. The equipment, h may be controlled by unskilled or, has automatic metal temperature trol, pouring control and casting le. The production results are of formly high quality. Production es appear to be from 20 to 30 percent her than by other methods. Less n 100 sq ft of working space is quired. The castings produced have gh tensile strength, grain structure uivalent to a forging and close di- ensional tolerances, reducing need for bsequent machining. **T-11-1611**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Automatic Unloader

A redesigned portable press unloader featuring a swiveling arrangement for side or back unloading is announced by Sahlin Engineering Co., Inc., P. O. Box 289, Birmingham, Mich.

The unloader is suited for job shop use because it can be moved quickly from press to press and is easily adjusted for different jobs. It is particularly applicable for use with back-geared presses where the gearing prevents mounting of standard overhead Iron Hands.



The new unloader, the Series 3000 Iron Hand, has the same jaw, air cylinder and controls as the standard overhead Iron Hand. The entire unit is mounted on a heavy steel base, on wheels. Set up by a press, it can be adjusted up or down on its vertical post to suit the die height, and swiveled into unloading position. The jaw travel is in a straight line, so the unloader can remove small parts at high speeds.

T-11-1612

Conveyor Units

Install-Your-Own, pre-engineered conveyor systems are announced by Lamson Corp., Syracuse, N. Y. The line includes light-duty wheel gravity as well as medium and heavy-duty roller gravity conveyor sections in standard widths. A center drive and take-up unit is available to attach to a roller gravity section to make a belt or live-roll conveyor. Other components include unit boosters, vertical and horizontal curves, tail and take-up units and a variety of supports.

The pre-engineering and easy installation features make the units so flexible that a system can be moved, extended, changed, speeded or slowed to fit new products, production schedules or building changes. **T-11-1613**

Monitoring Unit

An electronic scanning instrument, which simplifies checking and controlling various steps in production processes, has been developed by the Fielden Instrument Div. of Robertshaw-Fulton Controls Co., 2920 N. Fourth St., Philadelphia 33, Pa.

The scanner is capable of monitoring up to 25 production points.

All 25 control points may be set in a matter of minutes by untrained personnel, using a bank of miniature slide wires. Individual changes in settings can be made on the same slide wires simply by resetting a small knob. All set points can be viewed and compared at a glance.

Twenty-five sets of red and green indicating lights on the face of the in-

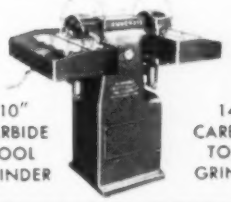
AN OUTSTANDING LINE

Hammond OF KALAMAZOO

CARBIDE TOOL CHIP BREAKER & DIAMOND FINISHING GRINDERS

MODEL CBW-6 CHIP BREAKER GRINDER

The Hammond Model CBW-6 Chip Breaker and Diamond Finishing Grinder is a *rugged performer* in Hammond's *outstanding line* of Carbide Tool Grinders. More Hammond Carbide Tool, Chip Breaker and Diamond Finishing Grinders are being used today — in more plants than ever before — to grind Carbide and High Speed Tools easily, accurately, better. Hammond offers "*America's Most Complete Line*" of Carbide Tool Grinders . . . Wet or Dry operation.



10" CARBIDE TOOL GRINDER

14" CARBIDE TOOL GRINDER

Hammond Machinery Builders INC

1661 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-161

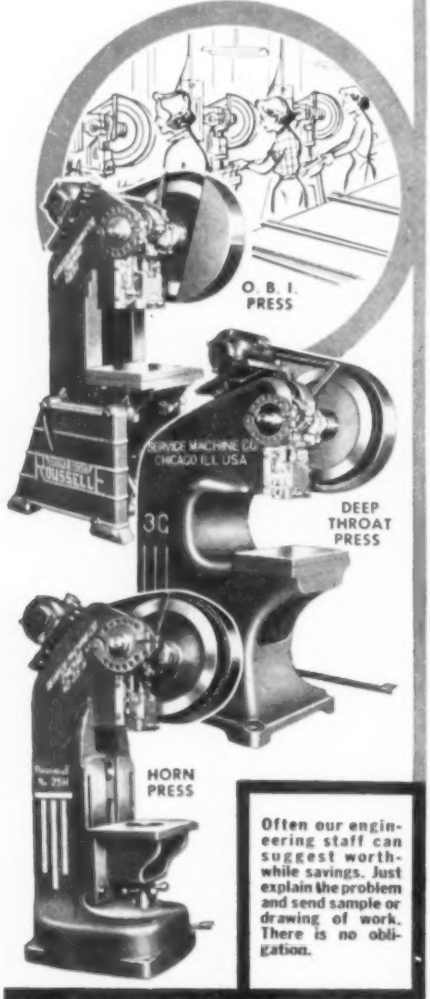
Expect *More* with a

ROUSSELLE

More strength where it counts...
More accuracy where it's needed...
More simplicity where it helps...

...to turn out first rate work FAST with steady, dependable regularity

You'll like the economical run-of-job cost, the simpler maintenance, the easier set up and operation and the wider variety of work each one can handle. And YOU'LL LIKE THE PRICE when you compare Rousselle specifications and quality . . . Ask for condensed catalog.



Often our engineering staff can suggest worthwhile savings. Just explain the problem and send sample or drawing of work. There is no obligation.

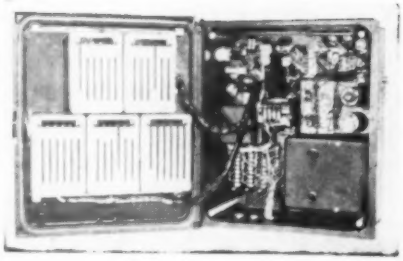
Rousselle presses are sold exclusively through leading machinery dealers.

SERVICE MACHINE CO.

Mfrs. of Rousselle Presses

2310 West 78th Street • Chicago 20, Illinois

INDICATE A-11-162-1

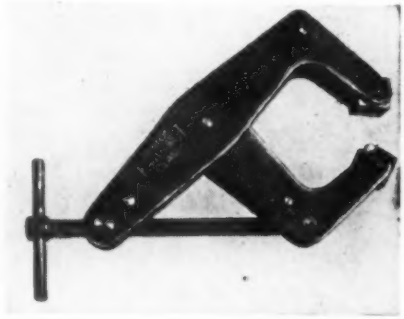


strument show the step under control and also whether the process is functioning properly. A simple two-wire connection to a recording instrument will give complete records of process operations.

The scanner is designed to check processes at a speed of either one or five points a second. A built-in "memory" feature causes the unit to bypass steps in the process that are not operating while it will continue to monitor the remainder of the production operation. **T-11-1621**

Clamps

A 1-in. Kant-Twist clamp for small precision work is available from Saxton Mfg. Co., Inc., 1517 North Potrero, El Monte, Calif. This clamp, like larger



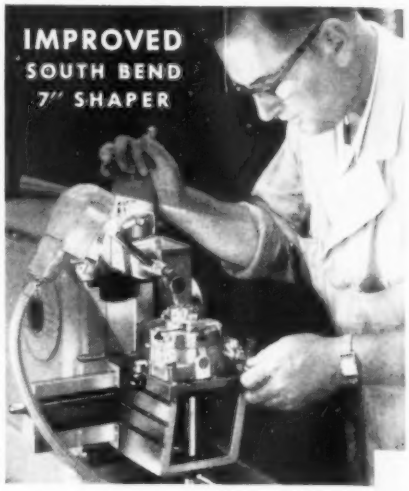
clamps in the line, combines the main features of C and parallel clamps. The side plates are made of high tensile steel. Each jaw is grooved for gripping rounds, and the jaws rotate in one plane. **T-11-1622**

Automatic Stud Welder

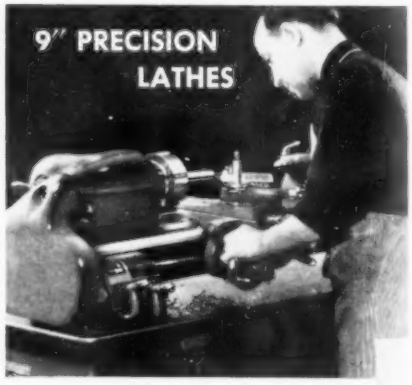
A fully automatic stud welding machine, introduced by Graham Mfg. Corp., 31465 Stephenson Hwy., Royal Oak 4, Mich., utilizes the Graham process of stored-energy stud welding. This unit can be fixtured for welding studs to strip stock fed continuously from a coil. In this case, stud feed to the gun is automatic. The machine does not require the constant attention

2 Top Values

for Small Work



Only 7" bench shaper with pressure lubrication of ram dovetail bearings, bull gear teeth and crank pin slide bearings—keeps wear to a minimum, helps absorb shock of intermittent cuts. This precision shaper has speed, accuracy and handling ease to produce more and better work at lower cost. Write for Catalog 5417. Factory price $551, less motor.



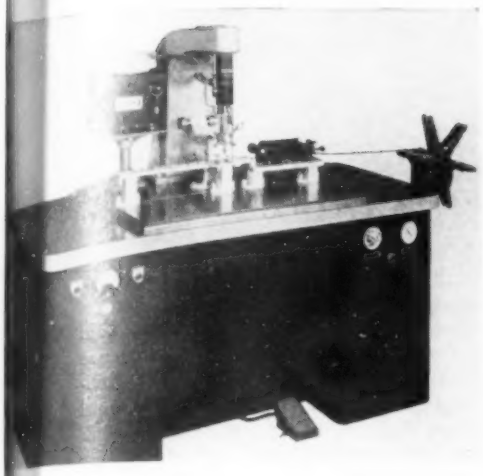
These popular lathes offer maximum value for your equipment dollars. Their quality and construction will give long years of dependable, efficient service on close-tolerance machining of small parts. Factory prices from $211, less electrical equipment. Write for Catalog 5432. 85 other models and sizes to choose from to meet your needs.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941
WAGES UP
155%
MATERIALS UP
131%
PRICES UP ONLY
49%
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SOUTH BEND LATHE

SOUTH BEND 22, INDIANA

INDICATE A-11-162-2



of an operator. Studs can be welded at the rate of approximately 80 per minute while power consumption averages 1½ kva.

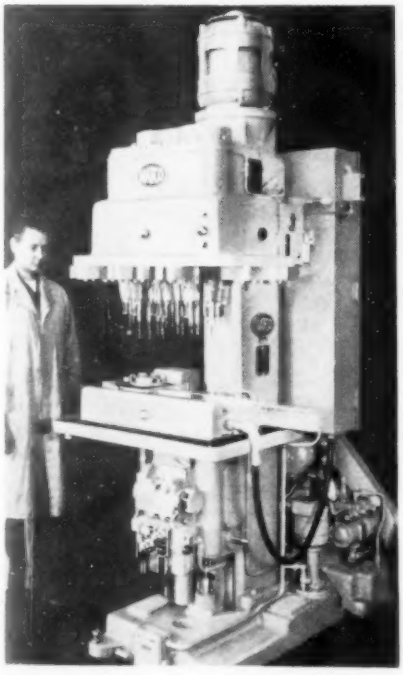
A revolving index table permits stud welding of individual parts or assemblies, while a pedal attachment permits single stroke operation of the gun with automatic stud feed also possible.

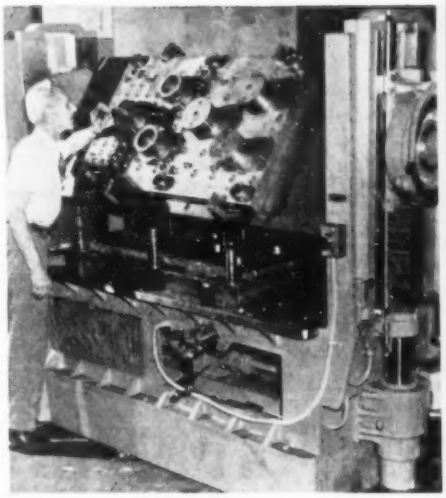
T-11-1631

Combination Drilling Unit

Development of a drilling machine which combines the operations of three machines in a single unit has been announced by the National Automatic Tool Co., Inc., Richmond, Ind. This Natco H-6 light, sensitive, adjustable, multi-spindle driller and tapper with a 3-position automatic fixture slide, drills, chamfers and taps holes automatically.

A typical feed cycle calls for: Position No. 1, drill: load part; rapid traverse; feed forward; rapid reverse; index to position No. 2. Position No. 2, chamfer: rapid traverse; feed forward; rapid reverse; index to position No. 3. Position No. 3, tap: rapid traverse; feed forward; feed reserve; rapid reverse; index to position No. 1. **T-11-1632**





Die Handler

The Hansford Mfg. Corp., 1239 University Ave., Rochester 7, N. Y., has added Model 1014 to its line of die handlers.

Largest in the line, this model han-

NEED HELP

In Cutting Holding Tool Costs?

SEIBERT SHUR-LOCK ADJUSTABLE ADAPTERS

● Better production machining methods at Seibert today make it possible to manufacture, in quantity, holding tools of improved quality without increased cost to you. The Seibert Shur-Lock adjustable adapter is one illustration. They are manufactured to precision tolerances from the highest quality hardened alloy steel, to give you the best in holding tools — certain to cut set-up time and give long service life. In addition, they are produced more efficiently than ever before which makes it possible to supply your needs promptly and at reasonable cost. Quality, Service and Price are the three reasons hundreds of users are today specifying Seibert tools. It will pay you to investigate the advantages of standardizing with Seibert.

WRITE TODAY FOR FREE ADAPTER BULLETIN AND LATEST PRICE LIST

Drop us a line today and ask for Folio 2-50 and a Price List — or, ask to have a Seibert representative call at your plant soon to check over your tooling problems. There's no obligation.

Convenient starting ring for easy installation
Relieved key seat for easier setups—eliminates swell
Total concentricity held to .002" (total indicator reading) 6" from end of tool
Precision ground threads for accurate adjustment

Shur-Lock Adapter Bodies

Shur-Lock Micro-Nuts

Shur-Lock Tension and Compression Tap Drivers

Spindle Extension Adapter Assemblies

SEIBERT **SEIBERT & SONS, INC.** CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-163

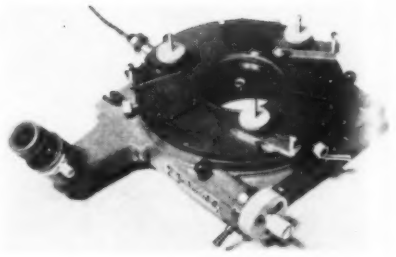
dles dies or molds measuring 36 x 75 in. weighing up to 6000 lb. Its top platen is of cast Meehanite and is raised and lowered with heavy precision lead screws, driven by a 2-hp electric motor mounted in the base. Under power, the top platen rises at the rate of 12 ipm. Fine adjustments in position can be made with an auxiliary hand crank.

The platen can be rotated with power supplied by a ¾-hp electric motor. An auxiliary hand crank is available for rotational movement.

T-11-1641

Optical Rotary Table

A small, economical precision optical rotary table is available as a separate unit through the George Scherr Optical Tools Inc., 200 Lafayette St., New York 12, N. Y. It is suitable for difficult inspection setups on surface plates, where accurate rotation in a horizontal plane must be combined with other measurements. Another use is in small precision machine tools and coordinate measuring instruments.

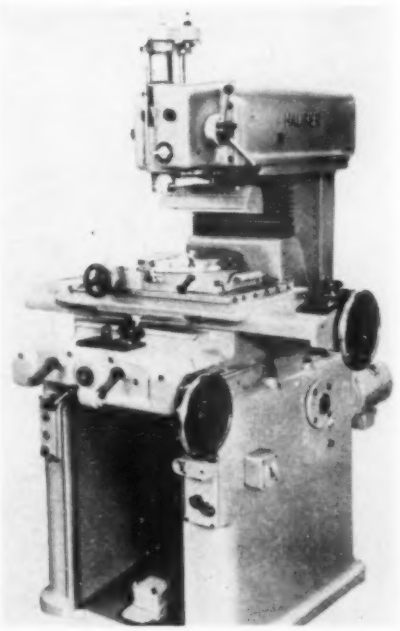


Because working accuracy of the table is obtained purely optically, it will be maintained indefinitely, and is not subject to wear. The master is a 360-deg glass circle, which is set to, and read through, an optical vernier which is superimposed and adjustable for zeroing. The vernier scale reads in one minute of arc; from it, 30 seconds of arc, which is the guaranteed accuracy of the table, may be estimated. The inclined eyepiece has individual focusing and is illuminated by a low-voltage lamp against the green field.

The table platen can be freely rotated by hand or by fine-adjustment worm and wheel, with means for locking it in position. Work is clamped and centered against built-in optical center mark by means of 6 radial T-slots. **T-11-1642**

Jig Borer

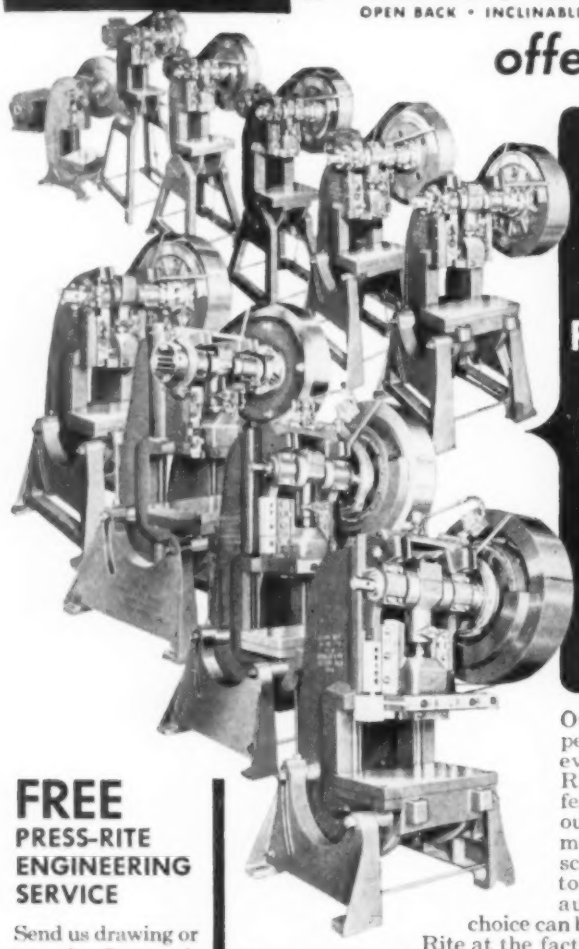
While sensitivity and ease of control of the earlier Hauser 2BA have been retained, other new features to increase its range and usefulness have also been incorporated in the 3BA, available in the United States from Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N. Y. Among the advantages of the



NOW PRESS-RITE

OPEN BACK • INCLINABLE *Power Presses*

offers you...



10 PROFIT-MAKING *Power* PRESSES

for AUTOMATIC or MANUAL FEED

2 to 85 ton CAPACITY

Outstanding profit-making performance is built into every heavy duty Press-Rite. You will find more features to help you turn out accurate stampings and meet tough production schedules. Dies last longer too! Also remember, the automatic feed of your choice can be mounted on your Press-Rite at the factory. Thousands of Press-Rites are being used daily in leading manufacturing plants. One of these 10 models (2, 5, 10, 15, 20, 30, 37, 45, 60, 85 ton) will do your particular job better!

FREE
PRESS-RITE ENGINEERING SERVICE

Send us drawing or sample. Our engineers will gladly help you select the right press. No obligation of course.

Write today for NEW Press-Rite Catalog showing all models with specifications and low prices.

SALES SERVICE MACHINE TOOL CO.

2353 University Ave. • St. Paul 14, Minnesota

PRESS-RITE

OPEN BACK • INCLINABLE *Power Presses*

Used by More—For More Production

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-164

are greater boring capacity, greater height adjustment, heavier quill, larger table surface and greater table travel.

Working surface of the table is 21¾ by 12¾ in.; longitudinal table travel is 15¾ in., while travel of transverse slide is 10 in. Maximum distance from boring spindle to table is 23½ in.; the vertical slide offers 15 in. of adjustment; vertical travel of boring spindle is 5⅛ in.

Included among the standard equipment features are dial indicator locating attachment, locating microscope, drill guide attachment, necessary wedges and setting blocks. **T-11-1651**

Steel Plate

Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill., has developed a lead-bearing steel plate to be marketed under the trade name of New E-Z-Cut.

The plate is not dependent on the addition of sulphur for free cutting quality. It offers improved machinability, welding, polishing and plating properties. Its flame cutting, forming, grinding and case hardening characteristics are considered equal to those of the earlier E-Z-Cut free machining plate.

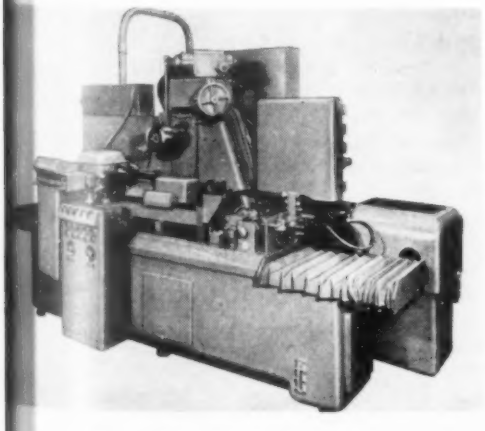
Initially, the new steel plate will be available from stock in thicknesses from ¼ to 3 in. inclusive. **T-11-1652**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Automatic Gear Grinder

Fully automatic gear-grinding machines, made by The Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich., feature automatic loading, rejection, stock equalizer, release of workpieces, down feed and trimming.

In addition to these automatic features, the unit offers controlled flow of



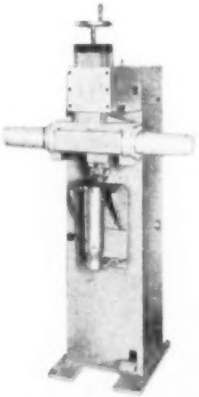
TECHNICAL data Lusol
TECHNICAL data Lusol
TECHNICAL data Lusol K-7
TECHNICAL data Lusol shamrock
TECHNICAL data Lusol Unikool
TECHNICAL data Lusol MACHINE CLEANER
TECHNICAL data Lusol G-3 GERMICIDE
TECHNICAL data Lusol TAPCOOL
Lusol
now offers
eight superior products to improve metal working
Lusol
Finest water-soluble coolant for high-speed work — especially with carbide tools.
Lusol Super-Concentrate
Double-strength Lusol for minimum storage and handling.
Lusol K-7
The ideal transparent solution for all grinding operations.
Lusol Shamrock
An excellent combination of cooling and lubrication.
Lusol Unikool
A high-quality, low-cost universal coolant and lubricant.
Lusol Machine Cleaner
Cleans machines of all dirt, gum, fatty materials, etc.
Lusol G-3 Germicide
An efficient method of ridding machines of bacteria.
Lusol Tapcool
A series of threading and tapping compounds.
TECHNICAL BULLETINS ON REQUEST
F. E. ANDERSON OIL CO., INC.
PORTLAND, CONNECTICUT
Lusol
BETTER PRODUCTS FOR BETTER METAL WORKING
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-165

for
- ✓ Marking round surfaces
- ✓ Marking flat surfaces
- ✓ Precision graduating
- ✓ Serial numbering
- ✓ Knurling

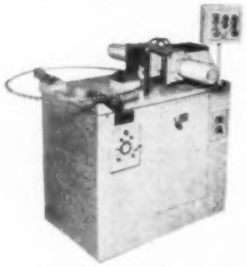
Model 46-354 marks bearing races 1" to 6" in diameter. Cyclomatic Control and air ejection require operator merely to load piece parts.

The NOBLEWEST Series 46 is a truly new concept in universal roll marking. Its *Dual-Function Head* incorporates a pneumatic pressure ram for depth of mark and a pneumatic die slide for roll marking. Combined in one integral unit, this new design offers wide flexibility in *machine design*—and *work capacity*. As illustrated, the *Dual-Function Head* can be mounted horizontally, vertically or at an angle . . . thus permitting a wide range of product application. Like all its famous predecessors, it employs the original NOBLEWEST roll marking process—producing sharp, permanent, sunken impressions—*good for the life of your product*. Whatever your needs for metal marking, NOBLEWEST makes the machines, marking dies and work-holding fixtures for doing the complete job faster, better, at lower cost. Write Noble & Westbrook Manufacturing Company, 16 Westbrook Street, East Hartford 8, Conn.

A few desirable territories open to qualified representatives.



Model 46-382 (Vertical) marks flat surfaces from shell cases to kitchen utensils with equal facility.



Model 46-387 marks large diameter jet engine rings and similar parts.

Copyright 1955—The Noble & Westbrook Mfg. Co.

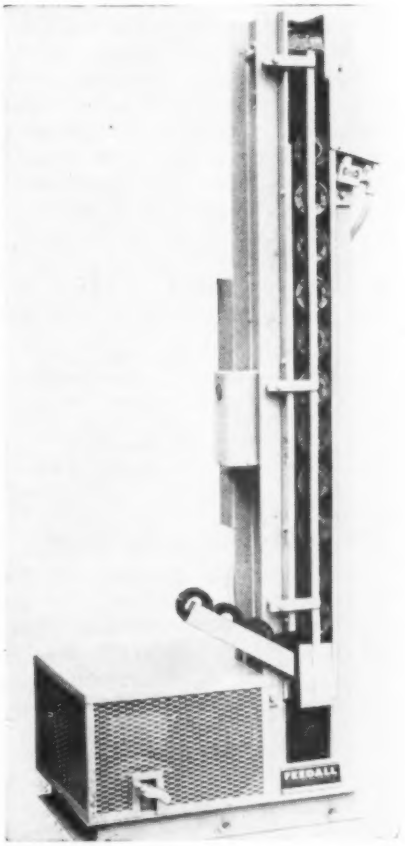
MARK IT BEST WITH
NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-166

coolant through the grinding wheel to assure nontempered, case-hardened gears; single or double diamond trimmers to blend fillet and profile; multi-ribbed grinding wheels which increase the production rate by increasing the number of teeth being ground simultaneously; multiple fixed diamond trimmers; and a time recorder attachment which accumulates total machine cycle time for production control. **T-11-1661**

Elevating Conveyor

A unit designed to transfer parts from one operating machine to another is announced by Feedall, Inc., Willoughby, Ohio. It accepts the parts from the discharge chute of the first



machine, and elevates and synchronizes them for delivery to the next machine. Both operating machines are set for the same fixed rate of speed; therefore, the Feedall unit operates at that same rate of delivery.

Series 4500 elevating conveyors will handle cylindrical parts up to 3½ in. in diameter and 1½ in. thick. Power is furnished by a ¼-hp, 220/440-volt motor through a variable speed drive. The unit can be modified to meet individual requirements. **T-11-1662**

Measuring Comparator

The 0-in. Model 100 measuring comparator has been developed by Paul M. Mel[illegible]son, 527 Main St., Acton, Mass., to meet exacting requirements of gage laboratories, inspection departments, tool and die makers and machine shops. It has an accuracy of 0.000039 in. over 10 in. of travel; it can be read to fractions of a micron. Underneath and vertical illumination make it possible to measure translucent, transparent, and opaque objects. For unusual measuring problems, standard or special holding fixtures can be supplied. The comparator is designed for ease of use, speed, versatility and lasting accuracy.

T-11-1671

Barrel Finishing Unit

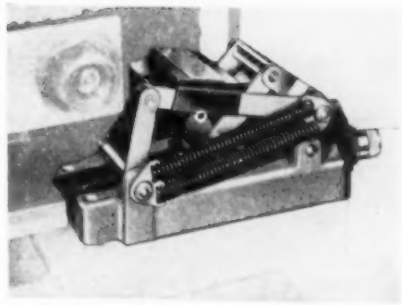
An economical, space-saving barrel finishing unit, especially suited for use in small or medium-sized manufacturing plants has been announced by Speed-D-Burr Corp., 3613 San Fernando Rd., Glendale, Calif., as an addition to its Mity-Mite line of Space-Misers. This compact, self-contained barrel finishing unit, requires floor space of only 40 in. wide by 26 in. deep. Over-all height is 48 in. with a comfortable work level of

34 in. The barrel is 20 in. long by 14-in. diameter and is shaft-mounted on factory sealed, self-aligning, ball-bearing pillow blocks. Barrels are available in 0.95 and 1.9 cu ft capacities. Motor is a ⅓-hp, 110-v, single-phase, variable speed with switch and 8-ft cord. Versatility in operating speed allows maximum efficiency for either small or large workpieces. A sump-settling drawer is provided with 3 equal settling compartments and with drain outlet to connect to existing drain facilities—eliminating the need to build an expensive sump outlet in floor.

T-11-1672

Automatic Stock Feed

A low-cost, automatic feed for coiled stock up to 2 in. wide, is announced by Jaco Devices, Inc., 101 High St., Hingham, Mass. The unit has a max feed stroke of 2 in. and a micrometer adjustment to control length of feed travel to an accuracy of 0.001 in. This Jaco-Matic feed features strong construction designed for long, continuous runs. It is powered by the press ram and feeds



Lincoln Gage Tips
POOR GUS! HE'S GOT TROUBLE NOW
YEAH! BUT NOTHIN' COMPARED TO WHAT'LL HAPPEN IF THE BOSS SEES GUS CLEANIN' GAGES WITH THE AIR HOSE

AIR HOSES can damage a thread gage. Moisture will be deposited on the threads and quickly form a rust spot. Use a clean cloth to dry the gage after it has been rinsed in a good cleansing agent. Cover the gaging members with a rust preventative and moisture-proof coating before storing.

Thread gage tolerances are microscopic. A little carelessness or misuse can spoil a valuable tool.

When we make thread plug and ring gages, each operation is carefully and skillfully executed. We know our customers want fine precision gages, and we see to it that they get what they want when they want it. Why don't you join our many satisfied customers.

LINCOLN GAGE CO.

23900 HARPER AVE., ST. CLAIR SHORES, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-167

on either the up or the down stroke. Its tungsten carbide steel blade normally lasts for the life of the tool because it lifts clear of the stock on the return stroke. This also permits the feed to be used for soft stock without marring. It is easily installed on any mechanical, hydraulic, compressed air or electrically operated press. **T-11-1681**

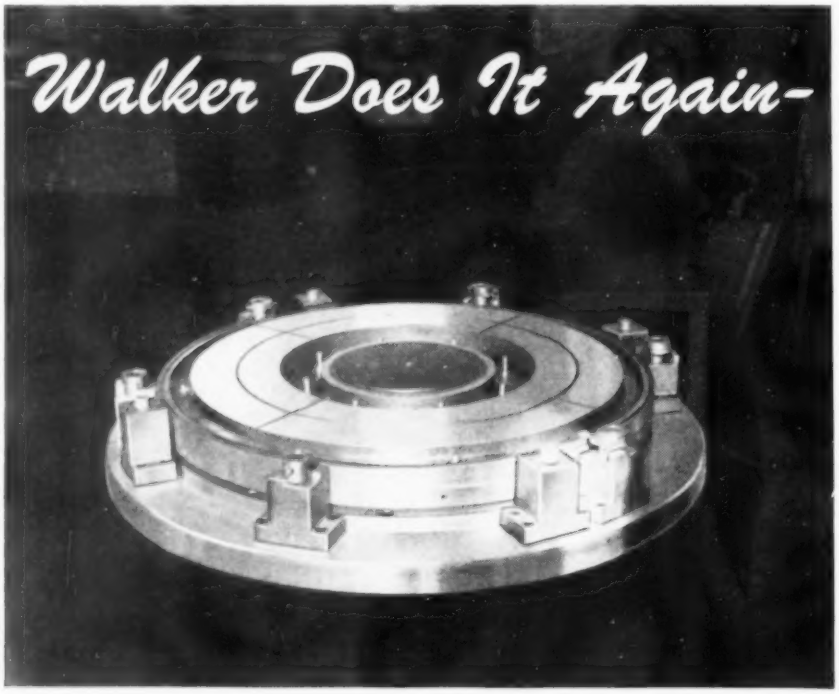
USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Dustless Grinder

Servicing the built-in dust collector unit of the No-Dust Grinders made by Hammond Machinery Builders, Inc., 1661 Douglas Ave., Kalamazoo, Mich., is now accomplished from the front of the machine. As a result of the simplification, the grinder may now be placed next to a wall and requires practically the same floor space as a grinder without the self-contained dust collector unit.

No-Dust Grinders are available in three sizes with 1, 2 and 3-hp motors using 10, 12 and 14-in. diameter grinding wheels. The self-contained built-in dust collector unit traps dust and dirt at its source from light tool or snagging operations, or from intermittent grinding on heavier operations.

The same basic construction is available without the built-in dust collector designated the OK Grinders. The dust collector unit can be added later and requires only a few minutes for installation. **T-11-1682**



The Walker Vacuum Chuck is proving an important essential in the development of the far-reaching jet engine program. *Non-magnetic materials* are held effectively for machining at a marked saving of time and effort. *Uniform quality and increased production are assured by actual performance.*

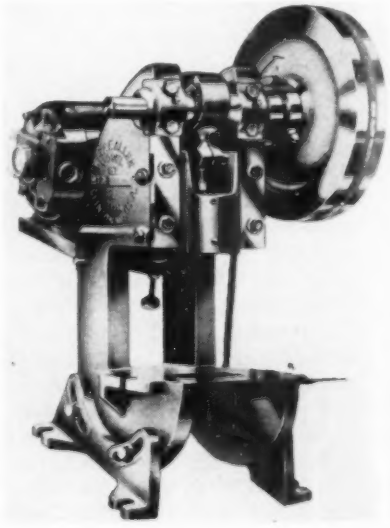
O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-168

OBI Punch Press

The Model BT-2 two-ton open-back, inclinable power bench type punch press, suited particularly to small stampings is available from Alva Allen Industries, Clinton, Mo.

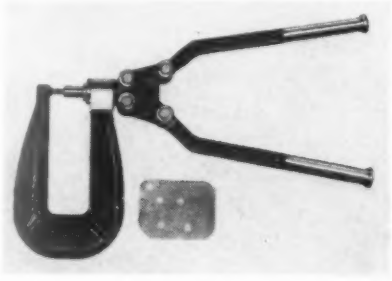
It has a mass-production capacity up to 250 operations per minute on continuous operation. Features of the de-



clude quick action, single-pin with simple, positive, nonrepeat at action; straight ram guides t gib for accurate fitting of dies cision stamping; accurate ram ment with simple, positive lock; tilted frame for operation at any Extra large die space is provided to accommodate stamping, shearing, forming, drawing, riveting, blanking, cutting of metal, plastics, textiles, fiber, leather or paper. With the unit inexpensive punches and dies for short runs can be made from cold-rolled stock. Standard stroke is $\frac{3}{4}$ in. with $\frac{1}{4}$ to $\frac{1}{2}$-in. strokes optional for an additional charge. **T-11-1691**

Punch with Toggle Action

Whitney Metal Tool Co., Rockford, Ill., is producing the Whitney-Jensen No. 15 deep-throat punch, which features a two-handled, powerful, toggle action. A swiveling construction permits either the head or the handles to



be rotated 360 deg around the axis of the punch. This makes the tool useful for many punching jobs where interferences or obstructions prevent the use of a conventional punch.

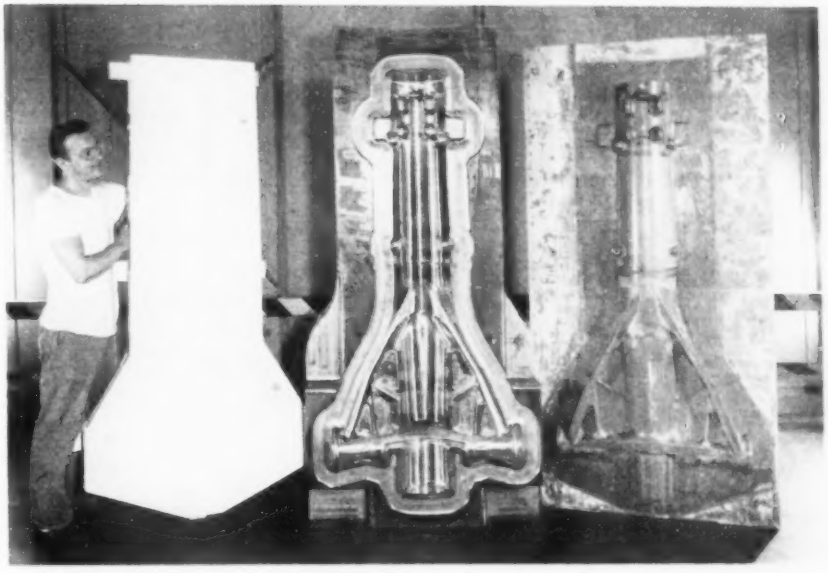
The new tool has capacity for a $\frac{1}{4}$-in. round hole through 16 gage mild steel. Extra punches and dies from $\frac{1}{16}$ to $\frac{9}{32}$ in. by $\frac{1}{64}$-in variations in size are also available. **T-11-1692**

Portable Band Saw

A high-speed steel blade for a portable electric band saw, introduced by Porter-Cable Machine Co., 59 Exchange St., Syracuse, N.Y., may be used to cut most tough metal materials such as stainless steel, carbon tool steel, nickel, and high-speed tool steel.

The blade was specifically designed for use with the Model 524 Porta-Band saw which is fast and light enough to be used in any position. Although it is little larger than a hand hack saw, it is considerably faster and makes a clean-

HYSOL Tooling Materials For Large Keller Patterns . .



Left above is the Keller pattern constructed of HYSOL tooling materials from mahogany wood pattern at right. Center is steel forge die Kellered from the plastic pattern. The Keller pattern was constructed by laminating glass cloth with HYSOL liquid tooling resin to

provide these OUTSTANDING ADVANTAGES . . .

Light Weight Patterns	Exact Reproduction of Wood Pattern
Excellent Surface for Stylus	Stability — No Special Storage
Unaffected by Lubricants	Lower Cost — No Skilled Labor, Equipment

Check the following list of some uses of tooling resins. You may find the solution to your problems.

Fixtures for inspection	Keller Patterns	Lathe Fixtures
Drilling	Draw Dies	Milling Fixtures
Locating	Hydropress Dies	Buffing Chucks
Trimming	Paint Masks	Core Box
Layout	Prototype Parts	Core Box Sections
Spotting Blocks	Spinning Chucks	Core Driers
Vacuum Forms	Holding Fixtures	Pattern Parts

Assembly Fixtures: welding—spot welding, arc welding, gas welding.
Molds for casting other materials.

PROGRESSIVE PRODUCTS THRU CHEMICAL RESEARCH
HYSOL
Division of HOUGHTON LABORATORIES, INC.

Houghton Laboratories' specialists in industrial plastics are ready to help solve your problems. Research, engineering, design and production facilities are available.

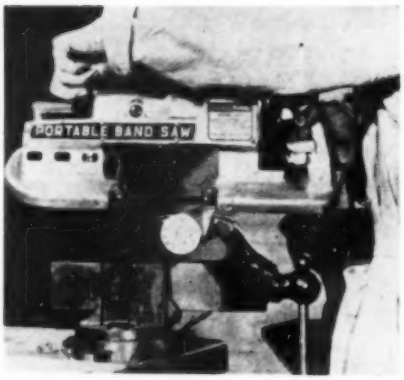
Write today about your plastic tooling problems and get complete information on how Houghton can help you at no obligation.

houghton laboratories, inc.
115 Bush St.
OLEAN, NEW YORK

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-169

er, more accurate cut. It is particularly suitable as a supplement to stationary equipment.

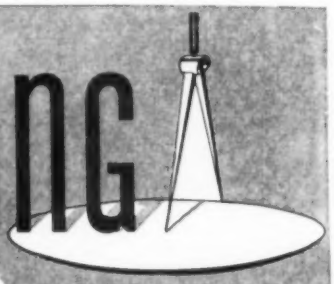
To provide the great cutting power of the small saw the ½-hp motor turns over 94 times for every revolution of the drive pulley. Band speed is 240 surface fpm under load which is midway between the ideal speed for cutting ferrous and nonferrous materials. The design of the saw enables it to cut rectangular stock up to 3¼ by 4¼ in., or round stock up to 3¼ in. in diameter. Conventional blades are available



in a range of 6 to 32 teeth per inch for most types of cutting. The high speed blade for tough materials is available in 6, 9, 12 and 16 teeth per inch sizes. A simple blade changing device speeds that operation.

While conventional blades are .025 in. thick, high-speed blades made from M-2 Hi-Speed Steel, are 0.020 in. thick. Both types of blade fit guides on the saw which are tipped at an angle so that the tool is out of the way of the cutting line. This permits cuts within ⅝ in. of the ground when working with conduit, cable or pipe. **T-11-1701**

to economize
STANDARDIZE *with* RING



precision **PUNCHES** and **DIES**

Ring Standardized Punches and Dies offer cost saving dependable performance for all of your perforating problems.

Precision volume production to rigid specifications offers

★ Low cost
★ Complete interchangeability
★ Immediate shipments from stock on Standards plus prompt delivery on Specials
★ High quality — long life

MANY SHAPES AND TYPES

ROUND SQUARE OBLONG HEXAGON RECTANGULAR

Blanks — Pilots — Headless — Shoulder and Bevel Head Quills — Slug Ejector Punches — Transfer Punches

NEW! Tough — Accurate Retainers for Ring Punches and Dies mount easily to your die set. Available in Key Type for irregular shapes.

WRITE FOR OUR ILLUSTRATED CATALOG

RING PUNCH & DIE COMPANY
23 FENTON PLACE
JAMESTOWN, N. Y.

Gentlemen: Please send me a copy of your new, complete CATALOG #104 at once.

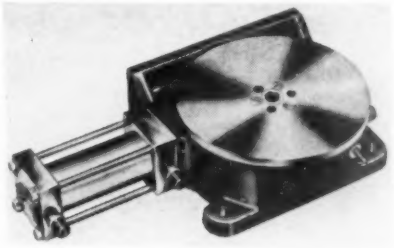
NAME .....
COMPANY .....
ADDRESS .....
CITY ..... ZONE..... STATE.....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-170

Dial Feed-Indexing Unit

Indexing dial feed tables, Allenair Models 725-EA and 725-EB, designed particularly to avoid override, are announced by A. K. Allen Co., 57 Meserole Ave., Brooklyn 22, N. Y.

Capable of indexing on 24 indexes at 300 cycles per minute with a 40-pound load on the top of the 7¼-in. diameter plate, they are specially suitable for use in areas where space is limited. A 10-in. diameter plate is optional.



Mounting is provided for either horizontal or vertical application and compressed air is available through the center stud for actuation of secondary equipment. The tables can be set for either 4, 6, 8, 12 or 24 indexes per revolution; special indexes are available on order.

Model 725-EA is furnished without control valves, while 725-EB comes equipped for fully automatic operation with controls regulating dwell time and forward motion without electricity. Accuracy is ±0.001 at the periphery of the standard top plate. **T-11-1702**

Magnetic Conveyors

Close grouping of machines to save floor space and increase possibility for automation is possible with the Homer Space Saver magnetic conveyors made by The Homer Mfg. Co., Inc., Dept. 381, Lima, Ohio.

Ferrous pieces and parts can be

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-11-276	Allegheny Ludlum Steel Corp.	**Die Steels**—Four-page report collected in laboratory and field tests. Complete data on applications, physical characteristics, forging, annealing, hardening, tempering, etc. (Page 276)
A-11-165	F. E. Anderson Oil Co.	**Cutting Oil**—Eight bulletins available giving technical data on Lusol cutting fluids. (Page 165)
A-11-176	Armstrong-Blum Mfg. Co.	**Hack Saws**—Catalog contains data on Marvel hydraulic hack saws. (Page 176)
A-11-155	Armstrong Bros. Tool Co.	**Tool Holders**—Catalog describes complete line of Armstrong tool holders. (Page 155)
A-11-182	Barnes Drill Co.	**Honing Tools**—Honing tools and abrasives are described in catalog 500G. (Page 182)
A-11-29	Bay State Abrasive Products Co.	**Mounted Wheels and Points**—New mounted point handbook with information including bonds, lubricant treatments, etc. (Pages 28-29)
A-11-258-2	Black Diamond Saw & Machine Works	**Drill Grinders**—Four-page illustrated bulletin on Black Diamond drill grinders. (Page 259)
A-11-177	Edward Blake Co., Inc.	**Flute Grinders**—Two booklets describe grinders used to achieve configurations for taps. (Page 177)
A-11-251	Brush Electronics Co.	**Surface Finish**—Booklet describes the way in which the Surfindicator surface finish measuring instrument fits in with ASA Standard B46.1. (Page 251)
A-11-227	The Carlton Machine Tool Co.	**Drilling**—Twenty-four-page booklet on how to achieve good, efficient, low-cost drilling. (Pages 226-227)
A-11-72	Clearing Machine Corp. Division of U.S. Industries, Inc.	**Presses**—Catalog describes the Clearing O.B.I. press. (Page 72)
A-11-238	The Cleveland Crane & Engineering Co.	**Shears**—Illustrated catalog No. 2011 gives construction and engineering details on Steelweld pivoted-blade shears. (Page 238)
A-11-265	Crane Packing Co.	**Lapping Machines**—Two bulletins contain technical information on Lapmaster machines and methods for measuring flatness. (Page 265)
A-11-294-2	Detroit Stamping Co.	**Toggle Clamps**—Literature available on new De-Sta-Co Models 557 and 558. (Page 274)
A-11-158	H. E. Dickerman Mfg. Co.	**Punch Press Feeds**—Information on 12 standard feeds that can be shipped from stock. (Page 158)
A-11-192	Erickson Tool Co.	**Holding Tools**—Catalog K contains interesting application data on holding tools. (Page 192)
A-11-IBC	Ex-Cell-O Corp.	**Drill Bushings**—Ex-Cell-O catalog No. 35936 contains information necessary for engineering and purchasing departments. (Inside Back Cover)
A-11-12	Giddings & Lewis Machine Tool Co. Davis Boring Tool Div.	**Stub Boring Tools**—Bulletin DB-50 contains information on stub boring tool sets. (Page 12)
A-11-44	George Gorton Machine Co.	**Indexing Pantographs**—Bulletins 2595-DS2611 and 2604-DS2611 outline many different applications for multiple-spindle indexing pantographs. Catalog 1655-2611 is the general catalog. (Page 44)
A-11-37	Greenfield Tap and Die Corp.	**Taps**—Facts affecting thread strength are contained in a new handbook, "Facts about Taps and Tapping." (Page 37)
A-11-264	Greenlee Bros. & Co.	**Automatics**—Catalog No. A405 contains information on Greenlee automatic bar machines. (Page 264)
A-11-297	Hannifin Corp.	**Valves**—Catalog contains information on the complete line of Hannifin control valves. (Page 297)
A-11-5	Hardinge Brothers, Inc.	**Chucking Machines**—High-speed precision chucking machines are described in Bulletin HCT. (Page 5)
A-11-239	Ingersoll Milling Machine Co.	**Milling Cutters**—Cutter Catalog 66F contains data on inserted blade milling cutters and boring heads. (Page 239)
A-11-220	Keller Tool Div. of Gardner-Denver	**Air Press**—Catalog Section 50 describes the advantages of the Keller compression riveter. (Page 220)

USE THIS HANDY FORM ➡

to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

1155 ***THE TOOL ENGINEER, DETROIT 38, MICH.***

READER SERVICE CARD

Please send me further information as indicated below:

(Mark Key Number of trade literature, tools or advertisements)

ADVERTISERS	TRADE LITERATURE	TOOLS OF TODAY
A—	L—	T—
A—	L—	T—
A—	L—	T—
A—	L—	T—

NAME _____ POSITION _____

FIRM _____ BUSINESS _____

Please Check One ☐ Firm Address ☐ Home Address } STREET _____

CITY _____ ZONE NO. _____ STATE _____

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-11-216-1	Louis Levin & Son, Inc.	**Small Drill Press**—Catalog M describes line of microdrilling equipment, collets, instrument lathes and precision tools. (Page 216)
A-11-184	Lipe-Rollway Corp.	**Bar Feed**—Booklet gives details on Lipe's AML bar feed for screw machine stock feeding. (Page 184)
A-11-156-2	F. J. Littell Machine Co.	**Roll Feeds**—Methods of tooling presses for automatic operation are described in Littell roll feed catalog. (Page 156)
A-11-274-4	McDonough Mfg. Co.	**Tool Grinders**—Illustrated Bulletin RK-2 describes the Sterling Model RK-2 tool and cutter grinder. (Page 274)
A-11-240	Metal Carbides Corp.	**Carbides**—Catalog No. 55-G contains 84 pages on carbides for all phases of machine work. (Page 240)
A-11-254	Nelco Tool Co., Inc.	**Cutting Tools**—Catalog contains data on over 850 standard cost-cutting, time-cutting carbide tools. (Page 254)
A-11-63	Niagara Machine & Tool Works	**OBI Presses**—Standard, general purpose and automatic models are described in Bulletin 56. (Pages 62-63)
A-11-191	C. A. Norgren Co.	**Lubrication**—Blueprint SL 5 gives complete data on Norgren Spray-Lube system applied in multiple tapping operation. (Page 191)
A-11-195	Oakite Products, Inc.	**Steel Cleaners**—Bulletins outline short cuts in the fields of organic finishing and electroplating. (Page 195)
A-11-233	The Ohio Crankshaft Co.	**Induction Heating**—"Typical Results of Tocco Induction Heating for Forming and Forging" are contained in new booklet. (Page 233)
A-11-260	Pines Engineering Co., Inc.	**Bending Machines**—Production data on bending of aluminum extrusions. (Page 260)
A-11-54	The Pipe Machinery Co.	**Gages**—Information on internal and external thread gages is contained in Catalog No. 10. (Page 54)
A-11-231	Reed Rolled Thread Die Co.	**Thread Rolling Heads**—The improved Reed Series B thread rolling attachment for automatic screw machines is described in Attachment Bulletin B-1. (Page 231)
A-11-241	Rivett Lathe & Grinder, Inc.	**Hydraulic Valves**—Flows for various piston designs, working drawings and specifications are included in catalog on solenoid-operated, subplate mounted valves. (Page 241)
A-11-197	The Rotor Tool Co.	**Rotary Tools**—Bulletin 41 contains data on J-2L impact wrench and other Rotor tools. (Page 197)
A-11-162-2	South Bend Lathe	**Small Machine Tools**—Catalogs 5417 and 5432 describe South Bend's 7-inch shaper and 9-inch precision lathe, respectively. (Page 162)
A-11-300	D. A. Stuart Oil Co., Ltd.	**Cutting Fluid**—Sulphur staining information is provided in D.A. Stuart Shop Note Book, Bulletin S-1. (Page 300)
A-11-266-3	P. A. Sturtevant Co.	**Torque Wrenches**—Valuable torque wrench data included in "Torque Manual." (Page 266)
A-11-295	The Taft-Peirce Mfg. Co.	**Surface Plates**—Taft-Peirce handbook contains valuable information on granite surface plates. (Page 295)
A-11-65	The Thompson Grinder Co.	**Grinders**—New 6" by 18" hand feed grinder, Type D, described in Catalog D-55. (Page 65)
A-11-66	The Torrington Co. Swaging Machine Div.	**Swaging Machines**—Booklet on swaging with detailed descriptions of Torrington rotary swagers and their capabilities. (Page 66)
A-11-180	U. S. Tool Co., Inc.	**Automatic Feeding**—Bulletin 80-T gives specifications for speeding output in press operations with automatic press room equipment. (Page 180)
A-11-146	Vascoloy-Ramet Corp.	**Toolholders**—Informative and illustrated catalog on V-R Toolholders and "Throw-Away" blanks. (Page 146)
A-11-196	S. B. Whistler & Sons, Inc.	**Magnetic Dies**—Catalog shows magnetic perforating die installations quickly made ready for production. (Page 196)
A-11-284	Wiedemann Machine Co.	**Turret Punch Press**—Bulletin 101 describes design and operation of small to semiproduction lot punch press. (Page 284)

BUSINESS REPLY CARD
No postage stamp necessary if mailed in the United States

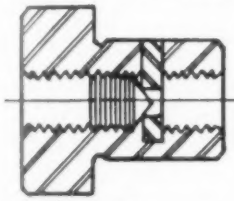
FIRST CLASS
PERMIT NO. 10782
(Sec. 34.9, P.L. & R.)
DETROIT, MICH.

THE TOOL ENGINEER
ASTE Building
10700 Puritan Ave.
Detroit 38, Mich.
ATT. READER SERVICE DEPT.

USE THIS HANDY FORM

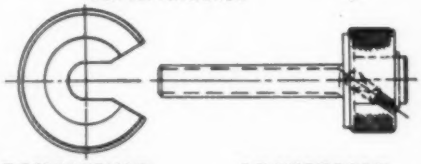
to obtain further information about advertisers, trade literature or tools of today appearing in this issue of THE TOOL ENGINEER. No postage needed.

NOBLE & STANTON
Standard
JIG & FIXTURE COMPONENTS
Just a Few of the Many
NEW ITEMS
in our Line of 500 Components


SURE LOCK FIXTURE KEYS

DOUBLE CAM LEVERS

FLAT NOSE HEEL CLAMPS
Soft for Alteration


EQUALIZING "C" WASHERS
ADJUSTABLE TORQUE SCREWS

FINEST QUALITY STANDARDS
For Your Tooling Program
Hundreds of time-saving, money-saving components shown in our

NEW CATALOG
66 PAGES
FREE!

Write for your copy!
Tracing sheets available for every part

STANDARD PARTS CO.
1012 BROADWAY • BEDFORD, OHIO
INDICATE A-11-173-1

conveyed up inclines as steep as 90 deg without need for long conveyor rises. These conveyors can pick up ferrous pieces from floor level and save time, for example, when removing scrap from receiving pits.

The Space Savers also automatically stack flat ferrous pieces, feed machines and perform other handling operations ordinarily requiring manual effort. Conveying speeds can be planned so that material transfer between machines may be synchronized for automatic operation.

They are available in stationary or portable types in either standard or custom units for new or existing production lines. **T-11-1731**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Perforating Unit

A line of sturdy unitized perforating units called Unipunch has been introduced by the Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y.

Designated Series A, these units have a maximum capacity of ¼-in. mild steel and are available in stock holder widths from 1 to 2½ in. Perforating range is from 0.093 to 1.500 in. They have been engineered to permit narrow holder width in relation to the maximum hole-size of each unit. With the top-mounted stripping spring, close hole-to-hole centers of perforations are possible.

Prime features of Unipunch units are the two-piece punch and the small button die which substantially reduce cost of replacement parts. Because the punch head slides off the punch body,

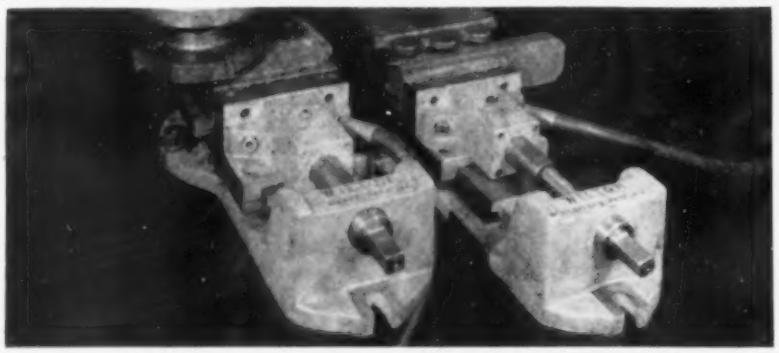
for lower cost per reamed hole

for quick selection
OF THE RIGHT L&I REAMERS

ask your L&I distributor... or write

L&I The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.
INDICATE A-11-173-2



BEAT THE TIME CLOCK WITH "MM"

Cut loading time 80%, turn out more work more economically with Wilton's fully automatic MilOmatic "MM" air-powered hydraulic vises. By using specially shaped jaw inserts you can make tooling changes quickly and practically elminate costly fixture construction. Start using the "MM" NOW to increase milling, drilling, shaping, and broaching output—and cut tooling costs in YOUR plant!

Attach this ad to your letterhead and mail to us for a free 10-day trial or free literature! TE-11

"The Finest Name In Vises"

WILTON TOOL MFG. CO., INC.

SCHILLER PARK, ILLINOIS

SOLD BY LEADING DISTRIBUTORS THE WORLD OVER

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-174

JOSEPH P. SPANG, JR.

Portrait by Fabian Bachrach

"A majority of the employees at Gillette . . ."

"The United States Savings Bonds program is good for the personal security of the bond buyer—good for the security and economy of the Country. A majority of the employees at Gillette Safety Razor Company purchase Savings Bonds the payroll savings way. Under this plan they find it easy to save a tidy sum for retirement years, to pay that unexpected bill, or meet the expense of other emergencies that arise."

JOSEPH P. SPANG, JR., *President*
The Gillette Company

If you have less than 50% employee participation in your Payroll Savings Plan . . . if you have not conducted a person-to-person canvass in the past two years . . . or if you do not have The Plan, get in touch with Savings Bond Division, U.S. Treasury Department, Washington, D. C.

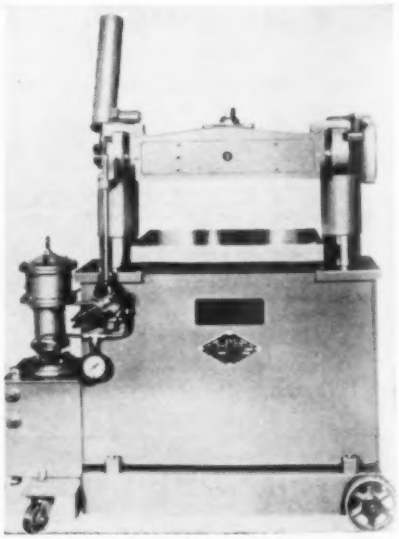
only the tool-steel punch body need be replaced. The small button die is held firmly in the die pedestal of the holder and can be replaced without removing the holder from the setup. Inexpensive replacement parts permit low-cost perforation with resulting economical cost per hole.

An important advantage of Unitized tooling is the ability to reuse a setup of such tooling in other combinations than that for which it originally was intended. **T-11-1741**

Die Tryout Press

A die tryout press of 50 or 75-ton capacity, which is operated either airdraulically or hydraulically, is available from Alpha Press and Machine Co., 9281 Freeland, Detroit 28, Mich. Head of this unit can be released and rotated to any point up to 240 deg. Two hydraulic cylinders are housed in the base.

The 50-ton press occupies 28 by 56 in. of floor space, while over-all height with stroke down is 64 in. The 75-ton press occupies 30 by 60 in. of floor space, and has an over-all height with stroke down of 66 in. Tonnage of the airdraulically operated press is based upon 80-psi air



ply. Both models are mobile. As other die tryout presses of the ha line, these models permit both members to be barbered, sheared, ed and finished without removal from ess. **T-11-1751**

Drafting Accessory

The Porta-Trace light box for use in analyzing tooling overlays or tracing faint originals is announced by A. F. Gagne, Jr., Associates, Binghamton, N. Y. The box is designed for maximum portability and user convenience.

Designed to fit on any desk or drafting board, the box is 1⅜ in. high and

can be used under a standard drafting machine or straight edge.

Rubber feet hold the box in position when used on a tilted board and allow shifting to various angles. Fluorescent illumination provides intense yet cool light; the top of the unit is shatterproof translucent plastic which cuts glare.

Five standard models range from 11 by 18 in. to 24 by 36 in. **T-11-1752**

USE READER SERVICE CARD ON PAGE 171 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Milling-Grinding Machine

Milling and grinding of relieved teeth on many types of cutters may be done on the Kirner automatic machine which operates on a template-controlled copying principle. Straight, spiral or staggered teeth can be produced.

Although the reduction ratio between the milling or grinding head and the template is normally about 4:1, this ratio can easily be varied.

Since the form is reproduced on a descending scale along the length of the cutter or grinding pencil, teeth produced are relieved on all sides. A constant profile can be obtained by using a taper cutter. The machine is automatic in operation and stops when all teeth on the work have been machined.

The grinding attachment has its own motor, driving the spindle at speeds up to 20,000 rpm, and imparts an oscillating motion to the grinding pencil.

The machine is made in two sizes. The smaller size takes work up to 2.75-in. in diam, with axial flute lengths between 0.08 and 1 in. Four cutter speeds between 700 and 1600 rpm are available, and five feed rates giving cutting-times per tooth between 8 sec. and 25 sec., inclusive of rapid return. Dividing disks provide for between 4 and 400 indexes per revolution of the work.

Larger machine is for work up to 5.5 in. in diam, and axial flute lengths between 0.31 and 2.30 in. Cutter-spindle speeds range from 250 to 2000 rpm in five stages, and feeds are steplessly variable to five cutting times between 15 and 90 sec. per tooth.

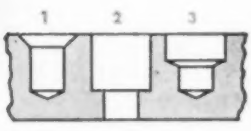
The machine is available from Jersey Mfg. Co., 401 Livingston St., Elizabeth, N.J. **T-11-1753**

A NEW CONCEPT!

MOHAWK
Size-Optional
SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)
(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

worlds largest producer of Sublands

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-175

Readers' Viewpoints

. . . unions for engineers

To the Editor:

I have read "Unions for Engineers" (M. L. Begeman, June 1955) with great interest. Although I am not an engineer and do not hold an engineering degree, I feel qualified to give an opinion. As a tool and gage designer, I work with methods engineers. Our jobs are related and overlap.

Our tool and gage department is unionized, the same union in which the company production workers are organized. We have just concluded 12 years of collective bargaining without a strike.

Tool design is a semiprofessional classification since a technical degree is not necessary. Our "degree" is a union card that admits us to the classification "engineer." I feel that engineers have not organized because they feel it is beneath their dignity. They would like the benefits a union can obtain for subprofessional groups but they are too proud to organize and admit they must use the same tactics.

It is true that unions have a leveling effect and tend to destroy initiative. However, companies have the same leveling effect. The company breaks jobs into simple operations, obtains the lowest skill to perform each job, then lowers the pay rate. This has more of a leveling effect and destroys more initiative than a union ever thought of doing. Jobs are so simple there is no opportunity for initiative.

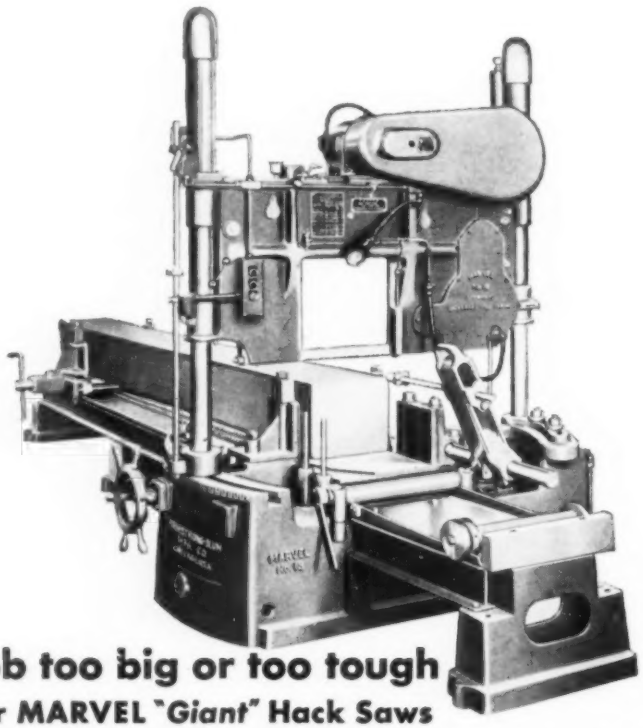
Every six months each of our tool designers sees his supervisor for an evaluation of his progress. He is given a raise at the discretion of the supervisor and the assistant foreman. The union has nothing to say about how much money an individual should receive. If the evaluation seems unfair, the union can take appropriate action. In five years, only two cases have required union intervention. A merit system, such as ours, seems to me to be the only way to evaluate progress in a design department. Since engineers do design work, I believe they could find their places in a union in the same way tool designers have. The sooner the engineer gets off his pedestal and realizes he is a labor commodity, as are all of us, the better off he will be.

In this article, it was indicated that a public relations program might help answer the engineers' problem. That may be true but I wouldn't want to sit down to a bargaining table with a corporation with just public relations to back me up. A corporation won't pay on the basis of standing in the community or for what an individual knows. It will pay for what is done with what is known.

James H. Watson
Junior Member ASTE
St. Paul, Minn.

The comments have been read with interest. It seems that different situations are being considered. My article referred to the professional rather than the subprofessional level. I believe there is little desire on the part of engineers, qualified by education, experience or both, to unionize. A possible exception might be for those engineers working in large organizations. Their feelings are undoubtedly controlled by the attitude of management toward them. If they are accepted and treated as professionals, I doubt that many would favor unionism.

Criticism against breaking jobs into simple operations is an argument against work simplification and specialization. Without it, our industries could not compete with other economies in the world. It has the advantage of extending work opportunities to many who might not otherwise be in industry. It results in greater production and lower costs, and assists in raising the



No Job too big or too tough

• • • for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18″x 18″; and No. 24, Capacity 24″ x 24″) were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

Write for Catalog

MARVEL Metal Cutting SAWS

ARMSTRONG-BLUM MFG. CO. 5700 W. Bloomingdale Ave., CHICAGO 39, U.S.A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-176

...dard of living. There are many ...ers who feel no distaste for these

...owever, this is not the type of work ...ngineer is called upon to do and ... little bearing as to whether he ...ld unionize or not. The leveling ...ct that an engineer may encounter ...es about when he is one of a large ...up and relies on the group to bar... for him. This situation may be ...sing to some engineers but cer...ly is not approved by all.

M. L. Begeman

To the Editor:

The problem ("Unions for Engineers," by M. L. Begeman, June 1955) is presented quite factually and the plea for recognition is common to all engineers.

I believe the ultimate advancement of the engineering profession must start in the schools of today. When English requirements for engineering students were increased, it represented a step in the right direction because it gave the engineer a tool with which to express himself in both technical and nontechnical application. Perhaps courses in the art of applying speaking and writing abilities to public relations should be the next step. If all engineering colleges would concentrate more on this phase of engineering education, I think engineers of the future would be in an excellent position to set the profession on the level it belongs.

It seems to me that even today the engineering profession is receiving more recognition. More and more engineers are being elevated into management positions. While these men can help the profession in their own spheres, they are unable to help others because of the lack of a single unified engineering group. Perhaps such men can form the core for a new group.

If a union of engineers does gain some success, I believe that it would be a detriment to the program of developing a real, recognized professional standing for engineers.

Louis J. Lovisek
Chief Engineer
Parker-Kalon Div.
General American
Transportation Corp.
New York, N. Y.

I believe the comments by Mr. Lovisek represent one of several things that must be done. The matter of improving the ability of an engineer to communicate effectively is receiving more attention at engineering schools. However, more effort towards developing professional recognition must be made by the engineers in industry. If they do nothing, it can be assumed they are satisfied with their present status.

M. L. Begeman

. . . control principle

To the Editor:

In his article, "Parts Produced to Size by Automatic Quality Control," August 1955, pp. 73-76, author David N. Smith states clearly a principle that every designer of automatically controlled machines should thoroughly understand. That is the principle that the control should ignore the variation that is inherent in the process and should regulate only for variation resulting from what quality control engineers call "assignable" causes, such as tool wear or temperature changes.

I have encountered a number of instances where designers apparently were not aware of this principle. The control was sensitive and made "corrections" within the normal inherent range of variation of the machine. Results were similar to those achieved by an operator manually adjusting for inherent variation by measuring each unit produced and making a change. The result is a considerable increase in variability of the process, as much as double the inherent pattern of the machine or process in some instances. Tool designers and engineers should be helped by Mr. Smith's clear statement of the principle.

Arnold E. Jakel
Milwaukee, Wisc.

You *know* that one rake angle gives best cutting in a particular material.

You can *grind* this rake angle into your taps . . . accurately and rapidly . . . with a Blake Flute Grinder.

What's more, this same machine assures *precise* indexing of the cutting edges . . . and will grind spiral points to the *exact* angle, location, and depth you need!

It will pay you to investigate.

The Story's Here.

Write for these booklets

EDWARD BLAKE COMPANY INC.
450 CHERRY ST., WEST NEWTON 65, MASS.
BLACK-DIAMOND PRECISION DRILL GRINDERS • SURFACE FINISH STANDARDS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-177

SUPEREAM

THE ONLY DECIMAL REAMER

No. 700 Straight Flute

with all FLUTES ground Face and Back After Heat Treatment . . .

Preventing Clogging or Freezing of Chips for

No. 720 Left Hand Spiral

REMARKABLE SMOOTH REAMING

No. 730 30° Left Hand Spiral

All diameters are held to plus .0002 and minus .000 for close sizing. Size markings are stamped half-way up on shanks so they cannot be obliterated by drill press chucks.

No. 740 7° Right Hand Spiral

ROSE CHUCKING REAMERS
AVAILABLE IN THE ABOVE FOUR STYLES ON REQUEST. DESIGNATE BY "R" IN FRONT OF STYLE DESIRED.

*In Emergency PHONE Libertyville 2-4200.

Write for Bulletin No. 10.

TWENTIETH CENTURY MANUFACTURING CO.
ROUTE 176 and BRADLEY ROAD
BOX 429E LIBERTYVILLE, ILL.

INDICATE A-11-178-1

Who's Meeting - and Where

Nov. 1-3. Grinding Wheel Institute and Abrasive Grain Association. Fall meeting, Statler Hotel, Buffalo, N. Y. For details, write Hunter Thomas Associates, 2130 Keith Bldg., Cleveland 15, Ohio.

Nov. 1-3. Investment Casting Institute. Annual fall meeting, Sheraton-Cadillac Hotel, Detroit, Mich. More facts may be had from Institute headquarters, 27 E. Monroe, Chicago, Ill.

Nov. 1-5. World Symposium on Applied Solar Energy, Phoenix, Ariz., sponsored by Association for Applied Solar Energy, Stanford Research Institute and University of Arizona. Write for details to director of public relations at the institute, Stanford, Calif. Symposium will be preceded by a Conference on Solar Energy—the Scientific Basis to be held Oct. 31 to Nov. 1 at the University of Arizona, Tucson, Ariz.

Nov. 2-4. National Fluid Power Association. Fall meeting, Chicago, Ill. Get complete facts from association office, 1618 Orrington Ave., Evanston, Ill.

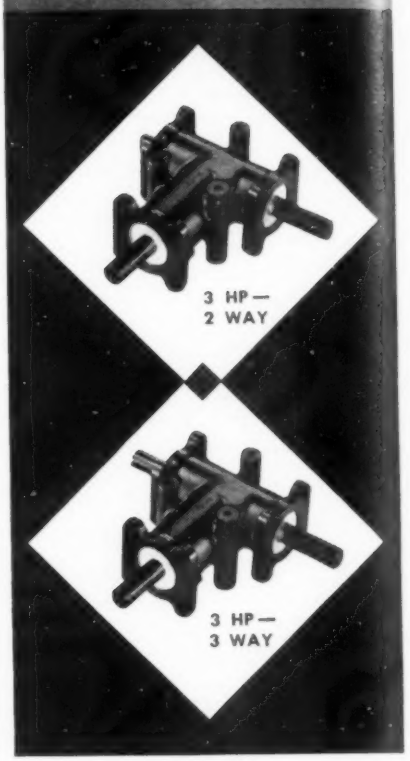
Nov. 3-6. National Tool & Die Manufacturers Association. National convention and board meeting, Statler Hotel, Detroit, Mich. For more data, contact association office, 907 Public Square Bldg., Cleveland, Ohio.

Nov. 13-18. American Society of Mechanical Engineers. Diamond Jubilee Annual meeting and exposition of power and mechanical engineering, Congress, Conrad Hilton and Blackstone Hotels, Chicago, Ill. Write for details to society headquarters, 29 W. 39th St., New York 18, N. Y.

Nov. 14-16. National Metal Trades Association. Annual convention, Hotel Commodore, New York, N. Y. Contact association office, 122 S. Michigan Ave., Chicago 3, Ill. for more facts.

Nov. 16-18. Society for Experimental Stress Analysis. Annual meeting and exhibit, Hotel Sheraton, Chicago,

NEW ANGLgear GEAR RATIO



2-1 plus new HP!

The right angle take-offs shown above — our largest 2 and 3-way ANGLgear models — are offered now with 2-1 gear ratio. They've also been up-rated to 3 hp at 1200 rpm.

The ANGLgear line — which also includes 1/3 and 1 hp units, with either 1-1 or 2-1 ratio — has long won acclaim in many fields for compact design and durability. They're sold only through your local distributor. See our literature in the product design section of Sweet's Catalog.

AIRBORNE
ACCESSORIES CORPORATION
HILLSIDE 5, NEW JERSEY
INDICATE A-11-178-2

Further details are available from society office, P. O. Box 168, Cambridge 39, Mass.

Nov. 17-18. AMERICAN SOCIETY FOR QUALITY CONTROL. 10th Midwest conference, Schroeder Hotel, Milwaukee, Wis. Write to society offices, P. O. Box 1264, Milwaukee 1, Wis. for more information.

Nov. 19-21. GRAY IRON FOUNDERS' SOCIETY INC. Annual meeting, Schroeder Hotel, Milwaukee, Wis. Get more information from society headquarters, 930 National City-E. 6th Bldg., Cleveland 14, Ohio.

Nov. 28-Dec. 1. AIR CONDITIONING & REFRIGERATION INSTITUTE, sponsors of exposition, Atlantic City Auditorium, Atlantic City, N. J. Complete information is available from Banner & Greif, 369 Lexington Ave., New York 17, N. Y.

Nov. 30-Dec. 2. AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS. Electric furnace steel conference, William Penn Hotel, Pittsburgh, Pa. More details may be had from institute offices, 29 W. 39th St., New York, N. Y.

Dec. 7-9. NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting and exhibit, Waldorf-Astoria, New York, N. Y. Further information is available from association headquarters, 2 E. 48th St., New York, N. Y.

Dec. 10-16. AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, sponsors of Atomic Exposition, Public Auditorium, Cleveland, Ohio. Get details from show management. International Atomic Exposition, 931 Book Bldg., Detroit 26, Mich.

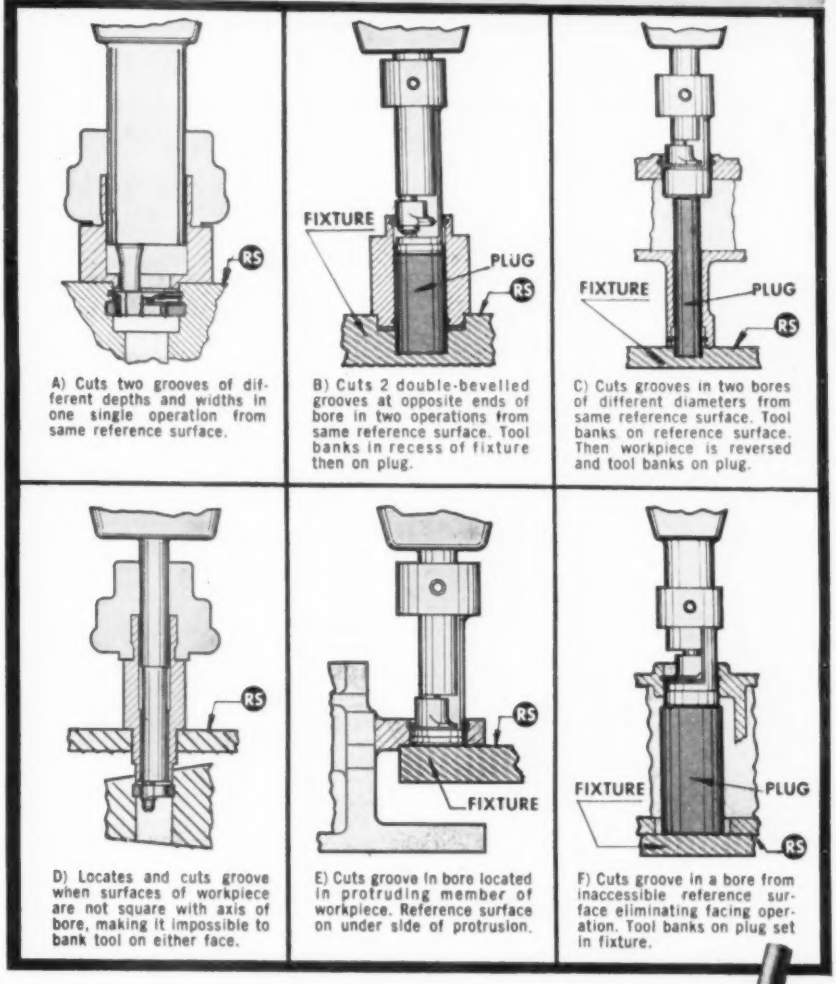
Dec. 12-16. ENGINEERS JOINT COUNCIL, coordinating Nuclear Engineering and Science Congress for 26 engineering and scientific groups. Public Auditorium, Cleveland, Ohio. More information may be had from Council office, 29 W. 39th St., New York 18, N. Y.

Jan. 9-13. SOCIETY OF AUTOMOTIVE ENGINEERS, INC. Annual meeting, The Sheraton-Cadillac and Statler hotels, Detroit, Mich. For more details, contact society headquarters, 29 W. 39th St., New York 18, N. Y.

Jan. 18-20. SOCIETY OF PLASTICS ENGINEERS. 12th annual conference, Statler Hotel, Cleveland, Ohio. Details are available from S. A. McElroy, Hercules Powder Co., 865 Union Commerce Bldg., Cleveland, Ohio.

Jan. 23-26. PLANT MAINTENANCE & ENGINEERING CONFERENCE AND SHOW, Convention Hall, Philadelphia, Pa. Complete facts are available from producers of the events, Clapp & Poliak, Inc., 341 Madison Ave., New York, N.Y.

Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

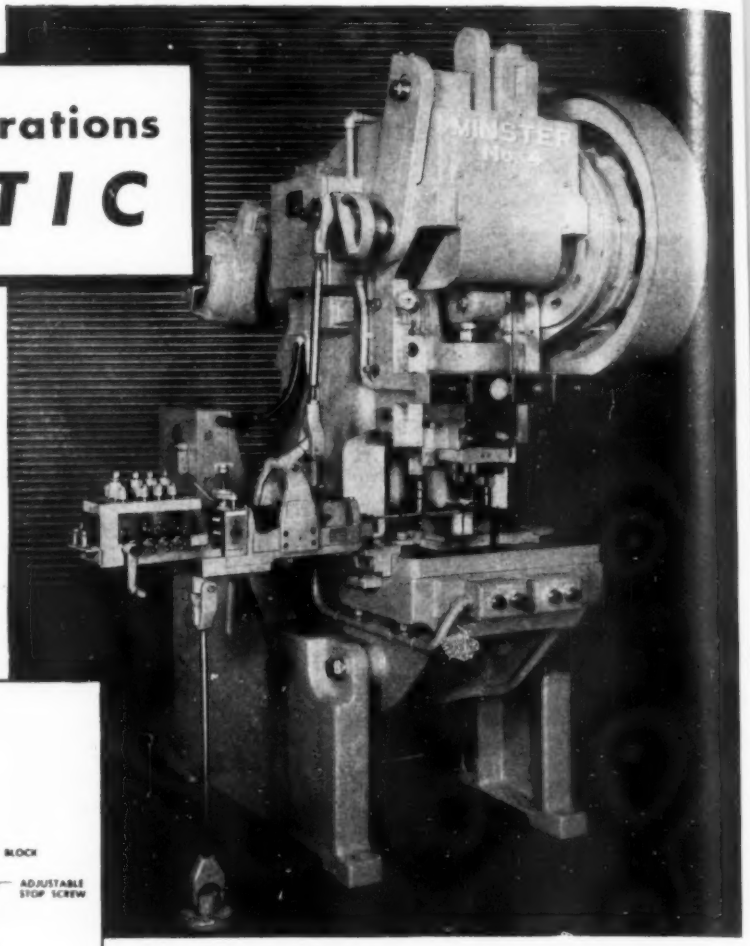
WALDES TRUARC® GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,411,426

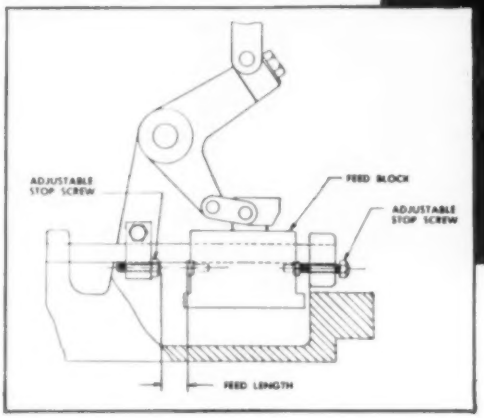
TE117
Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.
Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)
Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-179

Make Your Press Operations
AUTOMATIC



The photo at the right shows an SF-1 U. S. Slide Feed with SS-07 U. S. Plain Stock Straightener (7-roll type) mounted on a No. 4 Minster Press which is equipped with an air clutch and variable speed drive.



The drawing at the left shows how feed length is controlled between positive adjustable stops on the U. S. Slide Feed. This feature assures controlled accuracy of feed length—an especially important factor in progressive die operations.

Cost reduction is of the utmost importance to you. One means of achieving this is through automatic operation. U. S. Slide Feeds are designed and built primarily for the automatic feeding of coil stock into punch presses. By using a U. S. Slide Feed with a Straightener and a Stock Reel or Coil Cradle you can convert your presses into automatic machines.

The use of this equipment gives you the double advantage of increased production and reduced labor costs, plus the feature of flexibility. Within their capacity, U. S. Slide Feeds can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops as shown in the drawing, providing consistent accuracy that is especially desirable in progressive die operations.

We are sure that you want to reduce costs and speed output in your press operations. We suggest that you investigate the many advantages of U. S. Automatic Press Room Equipment. Bulletin 80-T gives complete specifications. Ask for your copy.

U. S. TOOL COMPANY, Inc.

Ampere (East Orange) **New Jersey**

Builders of U. S. Multi-Slides—U. S. Multi-Millers
U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

Men at Work

George F. Holland, president of Union Twist Drill Co., has been named chairman of the board according to announcement made at the recent meeting of the company's directors.

At the same time, the directors announced the elevation of **Stanley Holland,** general manager of the Butterfield Div., to the office of president. **Simon MacKay** was re-elected vice-president; **John C. Molinar** was vice-president in charge of sales; **Rossiter Holt,** vice-president and general manager of the S. W. Card Plant; **John Engelsted,** vice-president in charge of production of the Union Twist Drill plant, and **William E. Loy** was re-elected treasurer. Messrs. George Holland, Engelsted and Loy are members of ASTE's Northern Massachusetts chapter, and Mr. Holt belongs to Boston chapter.

James C. Mabe, Jr. has been appointed manager of plant operations for Chicago Pneumatic Tool Co. In his new capacity he will have jurisdiction over all manufacturing and engineering operations in the company's domestic plants. For the past 15 years, Mr. Mabe has been associated with Douglas Aircraft Co., Inc.

Two new vice-presidents and an assistant vice-president have been appointed at Beaver Tool and Engineering Corp. **Clement Ratke,** who has extensive experience in design and engineering of machine tool accessories, is now vice-president in charge of engineering. **Delmar Landen** was made vice-president in charge of sales, while **Wilbur Weise** was named to the post of assistant vice-president to work with him.

Announcement has come from Michigan Tool Co. of the appointment of **N. P. Synnestvedt** to the post of plant manager of its Manistee Iron Works, while **J. C. Maurer** was named shop superintendent. Mr. Synnestvedt was formerly supervisor of all purchasing activities; Mr. Maurer has been service manager at Michigan Tool.

Two recent appointments at the Kinney Mfg. Div. of The New York Air Brake Co. have involved **W. H. Crowley,** who became chief engineer, and **J. Raymond Marshall,** who was made equipment sales engineer. Mr. Crowley, who was assistant chief engineer, now is in charge of all engineering activities. Mr. Marshall was previously with Sylvania Electric Products, Inc.

Colson Corp. has revealed appointment of **Norman A. Price** to the office of vice-president and a director of the company. He will retain the post of director of sales, to which he was named earlier this year.

Promotion of **David B. Parkinson** and **John H. Harris** to vice-presidencies has been announced by Brush Electronics Co. Dr. Parkinson, as vice-president and general engineering man ger, is responsible for all design and production engineering at the company. Mr. Harris, in the office of vice-president and general works manager, is responsible for direct manufacturing, production control, maintenance and materials procurement.

Appointment of **Roy C. Heacock** as director of engineering has been made public by Axelson Mfg. Co., Div. of U. S. Industries, Inc. In his new capacity, Mr. Heacock will be in charge of engineering covering all of Axelson machine tool, petroleum equipment and aircraft products. For the past eight years, he has been associated with the Barber-Green Co. where he was vice-president and director of engineering and manufacturing.

George L. Abbott has been elected chairman of the board and chief executive officer of The Garlock Packing Co. Associated with Garlock since 1911, he has been its president since 1928.

R. S. Reynolds, Jr. is new chairman of the board of Robertshaw-Fulton Controls Co. Associated with the company since its formation, he has been a director and financial vice-president.

William R. McFarland has been made president and general manager of Atlantic Compound Co. For several years he was associated with the Lea Mfg. Co. in various managerial posts.

Henry R. Hanson, vice-president of Wm. K. Stamets Co., is new president of The American Machine Tool Distributors' Assn. He also is a member of the Cleveland chapter of ASTE.

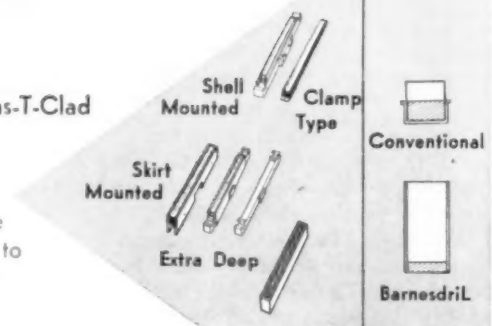
BARNESDRIL

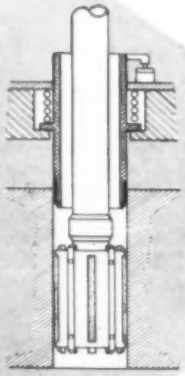
HONING TOOLS AND ABRASIVES

give you these features!

Maximum Body Support At Cutting Edges
— results in freer cutting and less spalling

"Extra Deep" Plas-T-Clad Stones
— provide more usable abrasive and more positive support closer to to the cutting edge





Plugmatic Sizing fo Positive Bore-to-Bore Accuracy
— sizes only on the bore, not affected by eccentric stone wear — self-aligning

Write for Catalog 500G

BARNES DRILL CO.

870 CHESTNUT STREET • ROCKFORD, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-182

Among the recent promotions announced at The Timken Roller Bearing Co. was the elevation of **Ralph W. Updegraff,** chief industrial engineer of the Bearing Div. who became chief industrial engineer of the company. At the same time, **Ross Russell,** who has been senior industrial engineer in the Bearing Div., was named divisional industrial engineer for the Steel and Tube Div.

Two other promotions at Timken Roller Bearing involved **John Rundt** who was made chief engineer of the division of research and development, and **Alva Kopatz** who became chief draftsman for the same division.

Appointment of **Christiaan Van Raaphorst** to the post of plant superintendent has been made public by Waterbury Mfg. Co., Div. of Chase Brass & Copper Co. He has been superintendent of the company's screw machine division since December of last year.

Vanadium-Alloys Steel Co. has made **William L. Batten** new manager of its powder metallurgy department. He has been associated with that department as sales and service engineer since its beginning in 1949.

C. S. Wiedman, product and process development engineer at Carboloy Dept. of General Electric Co., has been made manager of carbide products development engineering. His responsibilities will include direction of metallurgical development of carbide materials and related processes.

According to announcement from Consolidated Engineering Corp., **Kennett W. Patrick** has been named director of the company's Transducer Div. while **Harry E. Burke, Jr.** was promoted to succeed him as director of the Systems Div. At the same time, **Walter B. Claus,** who has directed activities of the Transducer Div., was assigned to undertake several special projects for the Manufacturing Div.

Jack Tregay has been made manager of machine development at Charles Bruning Co., Inc. Formerly, he was manager of A. B. Dick Co.'s Mechanical research and engineering laboratory.

William E. Hibbard has joined Superweld Corp. as application engineer. He brings to his new position more than 20 years' experience in mechanical and metallurgical engineering.

Trade Literature

For Free Booklets and Catalogs—Convenient Request Card on Page 171

Steel Bar

Twenty-page illustrated brochure discusses advantages and important features of company's new Fatigue-Proof high strength, free machining steel bar; outlines its uses, chemical and physical properties. LaSalle Steel Co., P. O. Box 6800-A, Chicago 80, Ill. **L-11-1**

Surface Grinders

Latest addition to company's line of small precision units described and illustrated in Type D Surface Grinder catalog; clearly illustrates all details of machine and includes drawings and specifications. The Thompson Grinder Co., Springfield, Ohio **L-11-2**

Heating Steel

Thirty-two page booklet, "The Rate of Heat Absorption of Steel" offers detailed information on simplified method by which heating rate of steel can be calculated and the center temperature of the piece predicted; 15 charts and diagrams included to help clarify text. Bloom Engineering Co., Inc., 857 W. North Ave., Pittsburgh 33, Pa. **L-11-3**

Drawing and Forming with Wax

Booklet explains functions and advantages of wax in metal forming operations; discusses physical function of wax during drawing operations; case histories used to illustrate various points such as scrap reduction possibilities; avoidance of drawing setups, increase in die life and other economies. Industrial Products Dept., S. C. Johnson & Son, Inc., Racine, Wis. **L-11-4**

Grinding

Extensively illustrated brochure presents Kellerflex line of flexible shaft machines and attachments for filing, polishing, burring, sanding, grinding and wire brushing, emphasizing speed, economy and quality results. Pratt & Whitney Co., Inc., West Hartford 1, Conn. **L-11-5**

Dimensional Cams

Illustrated folder describes evolution of 3-dimensional cams from theory to working finished product. Parker Stamp Works, Inc., 650 Franklin Ave., Hartford, Conn. **L-11-6**

Industrial Diamonds

Advantages of diamond abrasive for rough grinding and for final polishing are presented in pamphlet "Metallographic Polishing with Diamond"; illustrated booklet is second in series prepared by Elgin in a continuing program aimed at keeping industry informed on effective and economical use of diamond. Abrasives Div., Elgin National Watch Co., Elgin, Ill. **L-11-7**

Fasteners

Well-illustrated 32-page "Fiftieth Anniversary Catalog No. 55" describes several hundred different sizes and types of fastening devices and formed parts for application by resistance welding; also discusses advantages and procedures to be used in applying company's fasteners by resistance welding techniques. The Ohio Nut and Bolt Co., 33 First Ave., Berea, Ohio. **L-11-8**

NEW
GREAVES
TOOLMAKERS
OVERARM

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keywaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4" tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

- Swivels permit any angular setting of spindle head.
- 2 HP Independent motor drive.
- 8 speeds from 175 to 1750 RPM.
- Quill has 4" hand feed.
- Spindle equipped with No. 50 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in oil bath.
- Full vision oil level gauge.

RACK FEED. The overarm is equipped with rack feed for positioning over work.

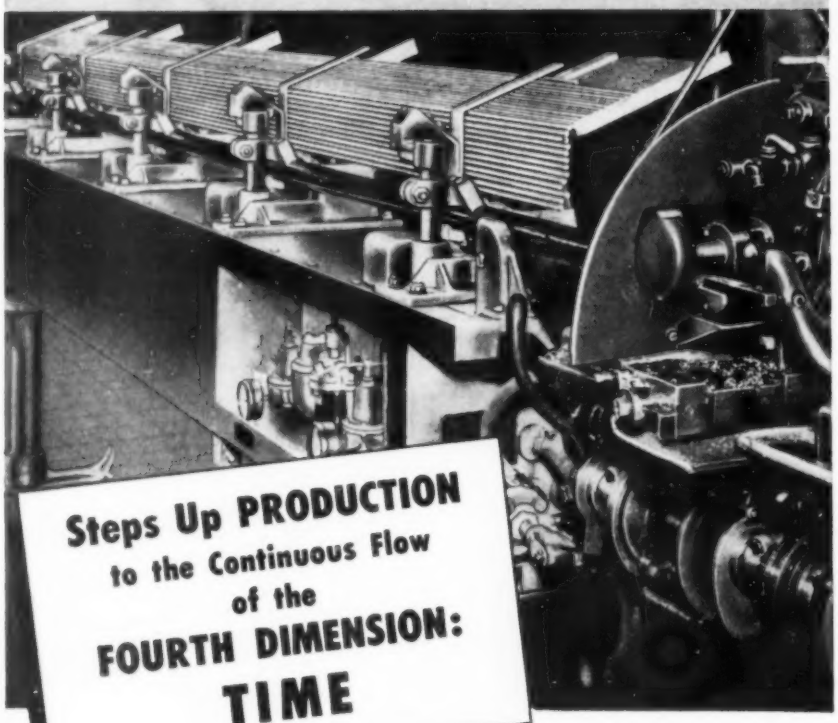
Write for Complete Specifications and Prices

GREAVES MACHINE TOOL DIVISION
J. A. FAY & EGAN COMPANY
2303 Eastern Avenue, Cincinnati 2, Ohio

Manufacturers of
GREAVES MILLS
"the MOST Mill for the LEAST Money!"

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-183

Now... A Screw-Machine-Feed that BREAKS THE TIME BARRIER!



Steps Up PRODUCTION to the Continuous Flow of the FOURTH DIMENSION: TIME

EVERY TIME a screw machine cuts air . . . every time feed fingers are adjusted or replaced . . . every time remnant removal forces a shut-down — *that's time lost forever, never again to be made up in the production quota!*

In the modern Lipe Automatic Magazine-Loading Bar-Feed, we present a continuous-feed mechanism that utilizes *every minute* of the working day for production . . . and still more production.

There's *No* cutting air. *No* feed fingers. *No* remnant problem. *No* minimum or maximum run. *No* limit on length of feed. *No* selective stock length requirement.

There IS a definite increase in production — up to 100% on some installations — *at least* 30% on every one!

Send today for FREE BOOKLET giving full details on Lipe's AML Bar Feed — today's big advancement in screw machine stock feeding. We will also supply name of your nearest distributor.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-184

Conveyors

Detailed information plus specifications and application data are included in illustrated handbook, "Lamson Conveyor Facts"; conveyors covered include roller gravity, wheel, belt and live-roll types; offers method of analyzing loads as to weight distributions and grades and gives charts of "when and where" to use various types of equipment. Lamson Corp., Syracuse, N. Y. **L-11-9**

Optical Tooling

Illustrated brochure offers information on company's line of optical tooling for aircraft, power generators, shipbuilding and precision machine industries; besides describing each item, booklet includes discussion of special features of equipment, lists specification and performance data and suggests applications. Farrand Optical Co., Inc., Bronx Blvd. & E. 238th St., New York 70, N. Y. **L-11-10**

Plating Tank Temperature

Data Sheet 5.1-4 describes application of instrumentation to various types of plating tanks; schematic diagrams of typical installations describe use of electric and pneumatic temperature control systems, and of recording, indicating and nonindicating instruments. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa. **L-11-11**

Silver Brazing

Technical booklet, "Silver Brazing With Preforms," deals with problems and solutions in that field; sections discuss types of joints and recommended preforms and importance of flux and its applications; well illustrated. Lucas Milhaupt Engineering Co., Cudahy, Wis. **L-11-12**

Power Presses

Bulletin No. 855 features the full line of Press-Rite power presses covering capacities from 2 to 85 ton; includes specifications and general descriptions plus an outline of important features. Sales Service Machine Tool Co., 2363 University Ave., St. Paul 14, Minn. **L-11-13**

Gear Grinders

Eight-page brochure on recently developed line of fully automatic gear grinding machines contains details of the automatic features as well as information on 5 additional features which assure high quality and production; includes photos, drawings and list of specifications. Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich. **L-11-14**

Drill Units

Illustrated 12-page catalog provides technical information plus descriptions, photos, line drawings and specification charts for company's Cam-Matic drill units; special section permits reader to visualize operational action of the unit on drilling and tapping operations. The Morris Machine Tool Co., 933 Harriet St., Cincinnati 3, Ohio. **L-11-15**

Needle Rollers

Engineering 12-page Catalog No. 61 contains previously unpublished data on rollers substantiated by successes of company's precision rollers in industry; includes size and specification lists plus application data. The Kaydon Engineering Corp., Muskegon, Mich. **L-11-16**

Threading Equipment

September issue of "Thread Tips" presents company's thread cutting grinding and rolling equipment which was on exhibit at NMTBA Show; close-up photos and drawings serve as demonstration of equipment's various features and functions. Earlier issue of "Thread Tips" contains comprehensive special report on Acme threads illustrated with tables, drawings and photos. Landis Machine Co., Waynesboro, Pa. **L-11-17**

Lubrication

Bulletin A-2406, "New Automatic Grease Monkey" describes company's Metermatic prelubricated bearing design now used on its a-c and d-c motors; explains operation and points out main advantages and features; illustrated. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio. **L-11-18**

Centrifugal Pumps

Brochure describes complete line of cradle-mounted general purpose centrifugal pumps outlining suitable applications, emphasizing special features and including performance data; extensively illustrated with photos and engineering drawings. Cameron Pump Div., Ingersoll-Rand, 11 Broadway, New York 4, N. Y. **L-11-19**

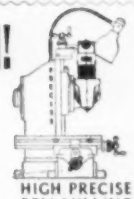
Forging Hammers

Eighteen-page Catalog No. 155 offers information on four types of hammers: cushioned helve, upright helve, upright strap and compact hammers. Includes illustrations, specifications and descriptions plus a history on the part of hot and cold forging. C. C. Bradley & Son, Huntington Ave., Cortland, N. Y. **L-11-20**

SUPER 30
GRINDER MILLER

World's most powerful and accurate hand!

Precise Super 30 Grinder-Millers bring new speed, accuracy and versatility to production or tool room milling, grinding or finishing operations. They weigh only 35 ounces, yet deliver 45,000 RPM, have a strong 1/5 H.P. motor, are accurate to .0001", run cool and can be used by hand or mounted on machines with abrasive wheels or new tungsten carbide tools. Save time, improve quality, increase tool life, and discover new tooling possibilities with the PRECISE SUPER 30.



HIGH PRECISE
RPM MILLING
MACHINES

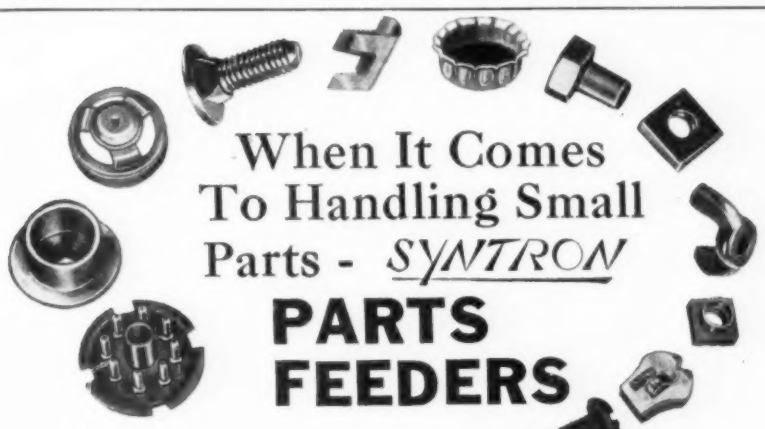
PRECISE POWER
QUILLS

Attach this ad to your letterhead
for FREE demonstrations or literature!

PRECISE PRODUCTS CORPORATION
1333 Clark Street, Racine, Wisconsin
Quality and precision since 1882

Precise

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-185-1



When It Comes
To Handling Small
Parts - *SYNTRON*

**PARTS
FEEDERS**

Write today for complete catalog—Free

. . . provide automatic controlled feeding at lower cost

Handle small parts of nearly any shape or material in oriented position — single file — without damage. Instantly controllable feeding rate insures steady flow of parts at required production speeds. Electromagnetc —no mechanical wearing parts—ideal for use in automation set-ups.

SYNTRON COMPANY
340 Lexington Ave. Homer City, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-185-2

you Can't automate...

. . . thinking. It's true you can punch figures into electronic brains and get fast, accurate answers. But they're only an aid to CREATIVE thinking, which can't be pushbutton operated.

Neither can Pioneer's engineers, but they can design, process and automate production of the finest pushbuttons as well as autos, home appliances, engines, machinery, etc.

Whatever your engineering requirements, write, wire or call today. No obligation, of course.

serving industry since 1931

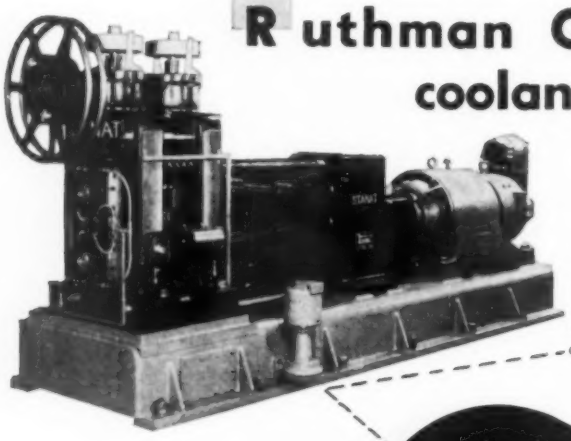
Pioneer ENGINEERING & MANUFACTURING CO., INC.

Telephone - TWinbrook 3-4500

19645 John R Street • Detroit 3, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-186-1

Ruthman GUSHER coolant pumps



Illustrated Stanat Model TA - 624 Combination Rolling Mill equipped with a Ruthman Gusher Coolant Pump.

Each Gusher Coolant Pump is precision built — a credit to the metal working machines in which they are installed. The dynamically balanced rotating assembly cuts vibration and wear to a minimum. Pre-lubricated ball-bearings require no further attention. There is no priming or packing necessary. Your Gusher Coolant Pump is a highly efficient precision machine.

Precision Built FOR EFFICIENT OPERATION

Model 11022

THE RUTHMAN MACHINERY CO.

1810 READING ROAD CINCINNATI, OHIO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-186-2

Control Equipment

Bulletin 1130, "Program Control of Process Variables" deals with methods and advantages of using automatic, time-conditions control for various industrial processes and tests; includes selection chart to help in choosing proper instruments for specific program control application. Request in writing directly from Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44, Pa.

Titanium

Up-to-date data on properties of titanium covered in illustrated brochure "Titanium Progress Report #2"; includes discussion of methods of fabricating, outline of mechanical properties of various grades of the metal, and table of comparative properties of titanium and other metals; also deals with primary and secondary fabrication methods as they are applied to titanium. E. I. DuPont de Nemours & Co., Inc., Wilmington 98, Del. **L-11-21**

Rotary Machines

Extensively illustrated Bulletin 75B covers in detail line of power and hand operated rotary machines and rolls, stressing construction features and advantages; selection charts help with choosing equipment for specific work. Niagara Machine & Tool Works, 637-397 Northland Ave., Buffalo 11, N. Y. **L-11-22**

Temperature Measurement

Informative 8-page booklet, "How Temperatures Are Measured" covers history of commonly used scales for measurement, physical effects associated with temperature rise and how measuring means utilize those effects, and other associated subjects. Tempil° Corp., 132 W. 22nd St., New York 11, N. Y. **L-11-23**

Reconditioning Bits

Illustrated booklet, "The When and How of Reconditioning Kennametal Bits," explains reconditioning practices and procedures, grinding and wheel care and maintenance of bits for variety of uses. Kennametal, Inc., Latrobe, Pa. **L-11-24**

Engine Lathes

Well-illustrated 16-page brochure describes Demoor engine lathe, giving complete details on construction, operation and features of units; includes specifications for 10 models in the line. Stokvis-Edera & Co., Inc., 18 Secatoag Ave., Port Washington, N. Y. **L-11-25**

Tool Holders, Cutters

Catalog describes and illustrates tool holders and cutters including carbide and high-speed steel milling cutters; includes photo, engineering drawings and specifications for each type and model plus discussion of their features, advantages and engineering points; also lists carbide grade recommendations for metal cutting operations and gives grade and speed suggestions for various materials to be cut. The Viking Tool Co., Shelton, Conn. **L-11-26**

Boring Machine

Illustrated brochure describes in detail the automatic Schwartzkopff KBF2 boring self locating precision machine including discussion of programming system which directs the machine by means of punched cards. Marac Machinery Corp., 45 S. Broadway, Yonkers, N. Y. **L-11-27**

Precision Springs

Basic considerations in designing precision springs covered in illustrated 8-page engineering data sheets punched for loose leaf filing; line drawings, graphs and formulae supplement text to explain various points. Engineering Dept., Hunter Spring Co., Lansdale, Pa. **L-11-28**

Stainless Steel

Forty-page design handbook, based on "The Functional Selection of Stainless Steels," outlines properties, specifications, applications and design data on 20 grades of stainless steel wire, rod and strip; one section of book deals with selection of stainless for corrosion resistance, heat resistance, mechanical properties and spring properties, while others present information on workability, cleaning and passivation, machinability and other techniques and practices; charts on properties, size and weight and other data enable designer to select right grade for particular application. Alloy Metal Wire Div., H. K. Porter Co., Inc., Prospect Park, Pa. **L-11-29**

Vacuum Melted Metals

Technical Bulletin VM-101 on vacuum melted metals and alloys includes both general information and technical data; covers effects of vacuum melting on properties of various metallic materials, benefits of process to users, fabricating and machining recommendations; also includes detailed engineering data on two new high temperature alloys. Carboloy Dept. of General Electric Co., Detroit 32, Mich. **L-11-30**

PRODUCTION COST

Cut 2/3

You Can Make a Similar Saving in Your Assembly Department!

DPS POWER SCREWDRIVERS
assembling automobile arm rests

● **These two machines maintain a production rate in excess of that previously attained by six hand operations, effecting an immediate saving of 66⅔%. This versatile equipment, used in prominent plants everywhere, can be adapted to your individual needs—So, get more action in your Assembly Department now—more speed—more profit. Write us, give details and our trained engineers will work out the proper solution of your problem.**

DETROIT POWER SCREWDRIVER CO.

2799-A W. FORT ST. DETROIT 16, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-187

it's NEW and it's NEWS!

"SHEAR-SEAL" 4-WAY VALVE

FOR 250 P.S.I. AIR

For years Barksdale Valves have provided a standard line of "Shear-Seal" valves for 2000 and 4000 p.s.i. air service, which no other standard valve can handle.

Then it is news when this highly efficient valve principle becomes available for the shop air service range at a very competitive price. The performance and internal construction of this popular model resembles closely that of its older, more powerful brothers. Automatic tooling for mass production has resulted in considerable savings in unit cost which are passed along to the user in the form of a high quality valve at this low list price. A twelve page booklet explaining the "Shear-Seal" principle in detail is yours for the asking. A number of convenience features have been incorporated in the design to take the strain out of plumbing or mounting. For example, any port can be used as the pressure inlet. A sturdy mounting bracket that can be turned where you want it comes as a "no charge" accessory. For the complete story, write for literature 2801.

*$18.50 is the list price for the ¼ inch port size and $19.50 for the ⅜ inch, less the usual quantity and trade discounts.

BARKSDALE VALVES

5125 Alcoa Ave., Los Angeles 58, Calif.

☐ Please send the "Shear-Seal" booklet

☐ Please send 2801 literature

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-188

Bearings

Revised general catalog presents complete line of self-aligning spherical bearings and rod ends including complete engineering data and specifications; data tabulated for easy reference. Kahr Bearing Div., Aetna Steel Products Corp., 812 S. Flower St., Burbank, Calif. **L-11-31**

Aluminum Alloys

General properties, fabricating characteristics, typical applications and available size ranges of each alloy covered in detail in folder which also includes alloy designation, weight comparison and temper designation charts. Peter A. Frasse & Co., Inc., 17 Grand St., New York 13, N. Y. **L-11-32**

V-Belt Drives

Information on design features, basic drive principles and technical data on sheaves plus helpful hints for economical, safe and dependable operation of V-belt drives included in 74-page "Tex-Book 20P40"; major portion of brochure contains multi-color tables developed for quick and easy selection of most suitable V-belt drives for particular work. Allis-Chalmers Mfg. Co., 1004 S. 70th St., Milwaukee, Wis. **L-11-33**

Grinding Wheels

Extensively illustrated Catalog No. 1-55 covers line of stock abrasive items; assembled for users' convenience in making selections of proper grinding wheel for common operations. Include price lists. Sterling Grinding Wheel Co., Tiffin, Ohio. **L-11-34**

Miniature Ball Bearings

More than 500 different standard radial ball bearings ranging from 0.0250 to 0.2500 in. described and tabulated by bore size in comprehensive, well-illustrated 24-page catalog; discusses design features, torque, speeds and tolerances, tabulates performance qualities, explains various characteristics in use; includes instructions for mounting, handling and lubricating. Engineering Dept., Miniature Precision Bearings, Inc., Keene, N. H. **L-11-35**

Industrial Heating

Twenty-page illustrated reference booklet, "Applications Unlimited," provides answers to questions on industrial heating by infrared process; case histories used to illustrate various points on economy and other advantages; includes information on types of industrial ovens available and their general specifications. The Fostoria Pressed Steel Corp., Fostoria, Ohio. **L-11-36**

abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

German Machine Tool Show

Simultaneously with the National Machine Tool Builders Show at Chicago, a German Machine Tool Exhibition was in progress at Hannover, West Germany. It is reported in the September issue of the Swiss magazine *Technica* and the September issue of *Werkstattstechnik und Maschinenbau*.

Precision of toolroom machines is stressed in a description of a universal die sinking milling machine with jig borer head for 30 to 6000-rpm spindle speeds. Accuracy is claimed to be 0.00016 inch for adjustment of the head. The machine can also be used as a precision measuring table when the borer head is replaced by a microscope. A double-spindle contour milling machine is shown with hydraulic-electric control for precision milling large dies. A special carbide tool grinder is illustrated for producing chip breakers of any desired shape.

Another machine exhibited was a planer on which the tool can describe arcs and other curves to produce curved surfaces. This is accomplished by a hydraulically controlled tracer attachment on the cross rail of the planer.

A lathe equipped with an elevated guideway in the rear of the machine permits plunge cuts simultaneously with turning operations. A push-button controlled vertical boring mill permits changing speeds during the cut without stopping the table, although apparently the table speed must be reduced before shifting in the high spindle speed range. This is accomplished by means of electric clutches. The machine can also be equipped with a device for automatically controlling the table rpm in order to keep the surface speed constant in facing operations.

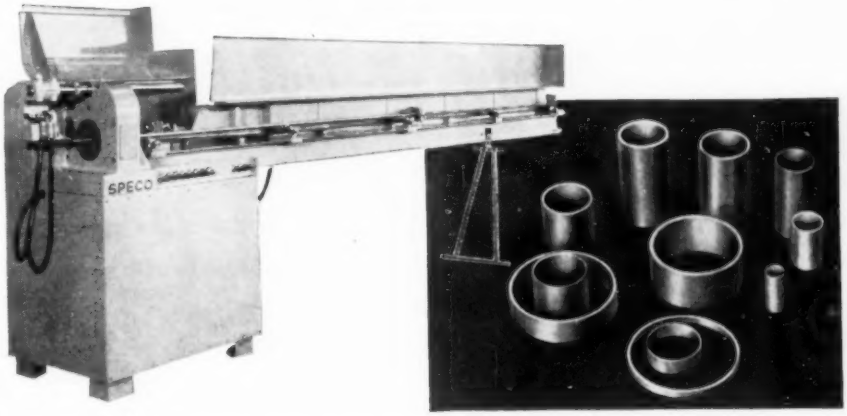
Bearings of a precision grinding machine are described; contact between spindle and steel bushing is confined to three areas around the shaft. The steel bushing is copper plated. On another precision grinder the table is equipped with roller guides and hydraulic seals

You can trim drawn shells like these in a single press stroke!

The Brehm "Shimmy" Die employs a *radically new* trimming principle . . . completely different from ordinary trimming methods. *A cam action inside the die moves the shearing edges four ways*—eliminating slow, costly "horn" and "pinch" trimming operations. You get a perfect edge finish every time . . . and a single die may be used for many different shapes. Production goes up fast. Production costs are slashed! Trims stainless and mild steel, copper, brass, zinc, aluminum, gold, silver, fiber, rubber, plastics. Trims all sizes from fountain pen ferrules to refrigerator doors—in almost any thickness that can be drawn. Brehm Dies can be used in mechanical or hydraulic presses.

The NEW Brehm Trimming Press does *all* trimming in one press stroke . . . takes less power, trims shells up to 16 inches square, 6 inches deep, .125 inch stock—metals, plastics or fibers.

Up to 10,000 pieces in 86 minutes with the new Brehm tube cutter!



The revolutionary Brehm Tube Cutter has a cutting action that makes it the finest machine of its kind ever built! Cuts tubes ⅜" to 2¼" O.D.—with production speeds ranging up to almost 7,000 pieces per hour! With the Brehm shearing action, *there is no loss of stock*—no burred tube ends! Up to 25% more pieces from the same length of stock. Cuts almost any tubing—mild steel, stainless steel, brass, copper, aluminum, etc.

Brehm
DIVISION OF SPECO

MAIL THIS COUPON TODAY

Steel Products Engineering Company
Dept. 35, 1205 W. Columbia St., Springfield, Ohio

PLEASE SEND FREE LITERATURE ON: ☐ BREHM TRIMMING DIE ☐ BREHM TRIMMING PRESS ☐ BREHM TUBE CUTTER

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-189

. . . the preferred dial indicators

TIME-TESTED FOR ACCURACY AND DEPENDABLE PERFORMANCE!

For more than half a century, industry has relied on Ames indicators for help in the solution of measurement problems of all kinds. And through the years, Ames indicators have done their jobs superlatively well. The Ames reputation for extreme accuracy, ruggedness and reliability through many millions of cycles is due to an unswerving dedication to our original guiding principle—to make the best possible indicators and gauges, through constant research and the use of highest quality materials and expert craftsmanship.

We will gladly make recommendations on your measurement problems. Please send blueprints and specifications. And ask for your free copy of the Ames catalog.

Representatives in principal cities

B.C. AMES CO.

30 Ames Street, Waltham 54, Mass.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-190

to prevent grinding dust and other particles from entering the guideway and rollers.

A grinding machine was shown for deburring spur, helical and bevel gears. The grinding wheel is shaped like a worm gear and remains in contact with the workpiece. Its profile is rough cut by carbide-tipped tools and obtains its final shape during the deburring process.

Grinding Helical Cutters

Helical milling cutters are customarily ground at the flank rather than the face, except in cases of breakdown of the cutting edge. Due to the fact that the chip flows substantially perpendicular to the helical cutting edge, it is necessary to measure the tool angles in a plane perpendicular to the edge, that is, at an angle with respect to the cutter axis.

H. Bossinger has analyzed these angles carefully and suggests grinding helical cutters in a different way. He has developed a grinding machine, which he describes in Issue No. 8, 1955 of *Werkstatt und Betrieb*.

The new grinding method permits bringing the flank of the tooth of the cutter into the plane of the face of the cup wheel. In conventional methods the wheel is adjusted to the clearance angle measured in a plane perpendicular to the cutter axis. The author claims that the new spiral attachment facilitates grinding helical milling cutters, reduces wheel wear and improves life of the cutter.

Circumferential Hammering Machines

Such machines, for the cold forming of barstock or tubes, usually have several hammers operating in pairs opposite each other. The cross section of the barstock is reduced, while the workpiece can be adapted to various shapes. With tubes it is possible to produce internal splines by cold forming.

H. Maeckelt, in an article in Issue No. 8 of *Werkstattstechnik und Maschinenbau* indicates that the term "hammering machines" is incorrect due to the fact that the tools are pressed into the workpiece rather than being permitted to drop onto the workpiece surface. Circumferential hammering, as it may be called, has several advantages, namely, short production time, good surface finish and strength of the workpiece due to the fact that instead of the fibers in the grain structure being cut as in machining with cutting tools they are bent to the desired shape.

The author presents results of a mathematical analysis of the forces involved and of the desired deformation of the workpiece. He has run tests to check his results and to determine the

hardening taking place in this process. The reduction in cross section was as high as 55 percent in the case of bar stock and 22 percent in the case of tubes, although in the latter case the reduction could have been increased still more. The tensile strength of the bar stock was increased from 58,000 psi to about 120,000 psi, better than a 100 percent increase in strength.

The same topic is discussed in another article published by H. Goszdowski in the same issue of *Werkstattstechnik und Maschinenbau*. He reports on various types of machines developed for circumferential hammering. The older types employ rollers and plungers while the newer machines make use of eccentric cams and piston rods. The newer types permit adjustment of the hammers during the operation, which was impossible with the older machines. Other machines employ levers with toggle joints or levers working under centrifugal forces. Some machines have hydraulic controls.

In addition to cold forming machines it is also possible to employ warm forming hammering. The author shows a great number of examples, among them tubes with helical internal grooves similar to helices produced on rifling machines.

It is not possible to cold hammer all materials; it was found that metals with at least 8 percent elongation are required for the process. The surface finish can be substantially improved as indicated by a few examples. In the case of carbon steel, German standard C-35, of about 1-inch diameter, reduced 4 percent in terms of cross section, the surface finish was improved from a maximum roughness of 0.001320 to 0.000135 inch.

Analysis of Experiments

The classical method of varying only one of several quantities when running experiments is time-consuming due to the fact that the entire range of tests must be repeated when one quantity is changed. E. Rossow in Issue No. 8, 1955, of *Werkstatt und Betrieb* outlines a procedure to replace the classical method. The author demonstrates that it is feasible to vary several quantities simultaneously in such a way that the effect of each variable can be determined from the same observations by summation or forming differences of the individual data.

Mathematical-statistical formulas are given in this article. Tabulation principles are discussed which show simplicity of the method. This will be of interest to research engineers and others when only a limited amount of data is available from which to draw conclusions. Examples refer to determination of Brinell hardness values.

Norgren Spray-Lube System as applied by Square D Co.

to multiple tapping operation, speeds production 30%

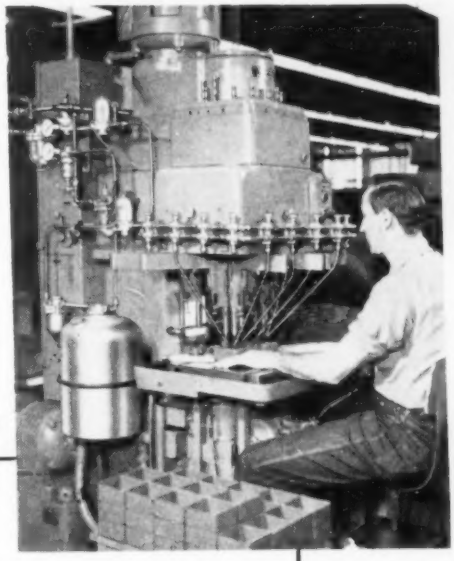
and in addition:

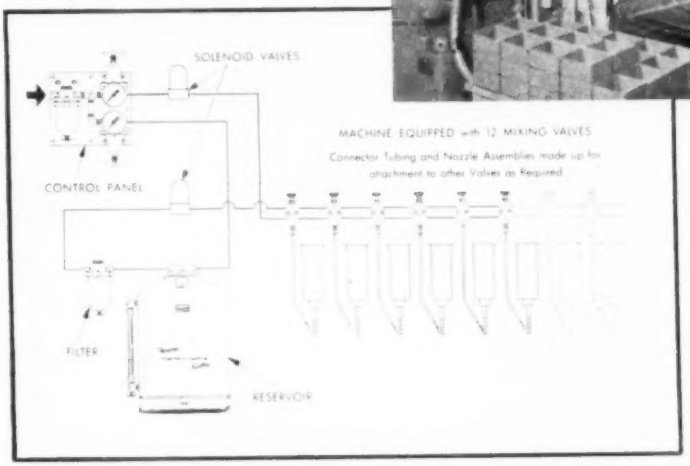
eliminates time and labor formerly required for draining and wiping tapped parts

relieves one man for more productive work

elimination of flood system greatly improves working conditions

substantial saving in lubricant




SOLENOID VALVES
MACHINE EQUIPPED with 12 MIXING VALVES
Connector Tubing and Nozzle Assemblies made up for attachment to other Valves as Required
CONTROL PANEL
FILTER
RESERVOIR

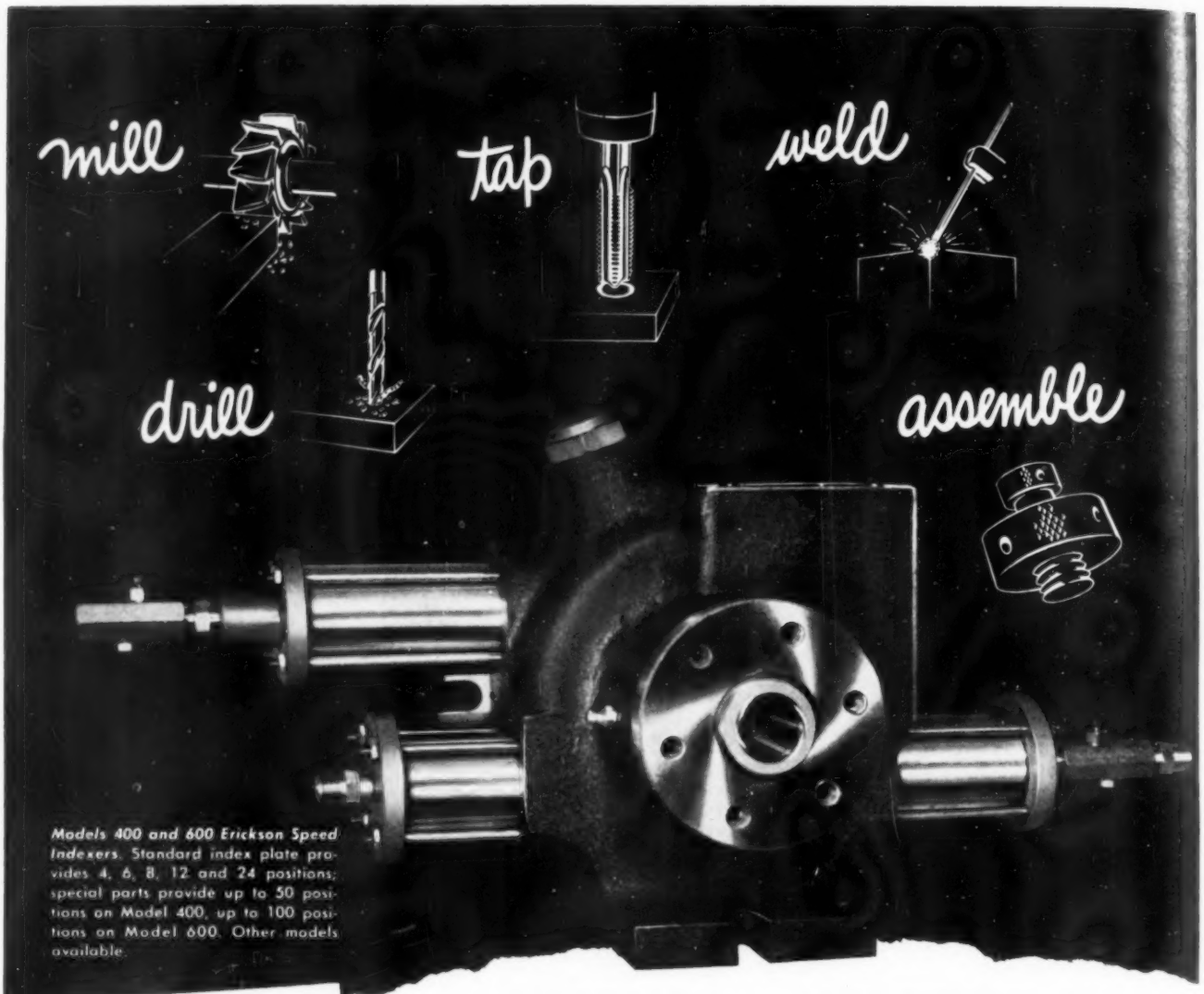
This tapping machine in the Square D Company production line handles a wide variety of tapping operations requiring as many as 12 taps in simultaneous operation. On job shown, tapping 3 holes in each of 2 switchbox covers, Norgren Spray-Lube System increased production 30% . . . eliminated the cleaning process. Even greater increases were reported on other jobs.

The unpleasant and hazardous disadvantages of the previous flood system, splashing lubricant over the operator and the surrounding floor, has been eliminated by Spray-Lube. Lubricant saving (Stanicut No. 107) has been substantial. Solenoid valves permit the Spray-Lube System to be actuated only when taps are approaching and contacting the work.

C. A. Norgren CO.
3450 So. Elati, Englewood, Colo.

For complete data on this Norgren Spray-Lube application write for Blueprint SL 5 or phone the Norgren representative listed in your telephone directory classified section under Norgren Pneumatic Products.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-191



Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

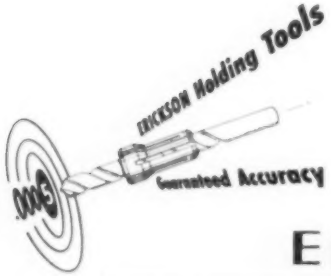
ERICKSON INDEXERS–

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . acouracy to reduce rejects . . . long life to cut maintenance and capital investment – all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.

ERICKSON TOOL COMPANY

2303-11-A Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

AA-2137

Field Notes...

Industry Approach Broadens Engineer Training

Industry has for some time been aware of its stake in education today and has instituted scholarship programs and training aids for use by schools. A more recent indication now is the summer training programs for faculty members fostered by some firms.

Giddings and Lewis Machine Co. has instituted a program which serves as a typical example. The faculty member designates his own area of interest; the company, from more intimate knowledge of its operation, makes up a tentative outline of the department or departments to be covered. A notice to each of those departments informs them of the time, dates, nature and purpose of the faculty member's visit, and serves as a working basis for systematic coverage. A key man in each department is assigned to the visitor for overall consultation and assistance. The plan in this program is in effect a working laboratory of the many principles being taught in the college or university.

This first-hand, up-to-date information is multiplied by the number of students who benefit indirectly by the background of the instructor, and the gain is eventually handed back to industry through the engineer trained through this broadened approach.

research

An extensive research and development program in titanium is planned by the Department of Defense to supplement its program of the past 10 years. According to N. E. Promisel, chief metallurgist of the Navy Bureau of Aeronautics and head of the Bureau's materials branch, the government also expects to initiate a study of titanium sheet rolling within the next few months. Mr. Promisel made the new plans public during a talk before a group meeting for a one-week program on titanium at the New York University College of Engineering. The research is expected to bring new alloys to users in industry in the shortest possible time. According to the speaker, the new government actions, together with the solution to certain technical problems and reduction in cost of the metal may lift the manufacture of titanium to the position of a big metal industry. He said that it now appears possible to achieve with titanium alloys the properties of high strength steel with only 60 percent of the weight of steel.

V V V

Plans for construction in Des Plaines, Ill., of a multi-million dollar research center is announced by Borg-Warner Corp. Work has already started on the first unit which, when completed, will cover 40,000 sq ft of floor space, or about one-fifth of the eventual area. The first building will form the central unit about which the entire laboratory will be built. The combination multi-purpose scientific and engineering operation will contain facilities for metallurgical, electronic, electrical, chemical, acoustical, hydraulic, applied mechanical, physics and nuclear research. In addition it will house a complete machine and model shop, modern computation center and large technical reference library.

name changes

Colonial Broach & Machine Co. has been announced as the new name for Colonial Broach Co. The new identification is considered more descriptive of the firm's activities particularly in view of the high volume of broaching machinery produced by the company in recent years.

V V V

The assets and business of Niles-Bement-Pond Co., recently merged into Penn-Texas Corp., have been transferred to a newly formed corporation known as Pratt & Whitney Co., Inc. This subsidiary of Penn-Texas will have Alexander H. d'Arcambal as president and general manager. The name Pratt & Whitney was selected for the company to perpetuate the Pratt & Whitney Div. which was the primary operating unit of Niles, and been closely identified with its field for almost a century.

Under the new setup, Chandler-Evans will be operated as a division of Pratt & Whitney Co., Inc., with Sidney A. Stewart as manager, and Potter & Johnston Co. becomes a direct subsidiary of P & W, with Edward P. Gillane as president and general manager.

V V V

The name of the organization formerly known as The Society of Industrial Designers has now been changed to American Society of Industrial Designers. The alteration was made in an effort to emphasize the national character of the society.

V V V

A program of expansion and reorganization has been started for the F & D Machine and Tool Works of Three Rivers, Mass. Reorganization of the company included a name change to The F & D Tool Co., Inc. There will be no change in management or in operating personnel. In addition, a program was instituted to enlarge and improve production capacity as well as increase stocks and expand operating and warehouse space.

acquisitions

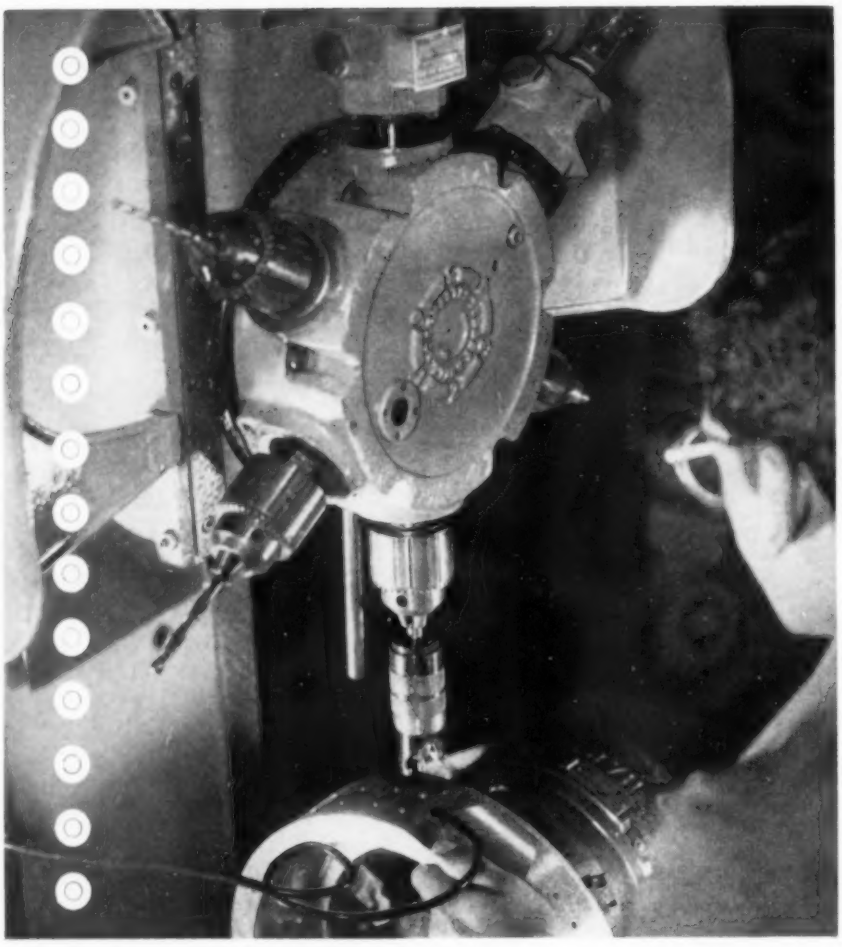
The aluminum extrusion plant at Halethorpe, Md. has been purchased by Kaiser Aluminum & Chemical Corp. from the General Services Administration. Cost of the plant was $3,841,000 cash. Kaiser Aluminum has been operating the facility since 1951 under terms of a lease. It presently houses five extrusion presses, one each of 4400, 1600 and 500 ton capacity and two of 2500 ton. It also includes necessary auxiliary equipment such as remelt furnaces, straightening equipment, die making and heat treating facilities. With the purchase of this plant, Kaiser Aluminum intends to nearly double its capacity.

V V V

Assets and business of Alloy Steel Products Co., Inc. has been acquired by Walworth Co. as a planned step in its diversification and expansion program.

V V V

With the purchase of 187,480 shares of Canadian Westinghouse Co., Ltd. from Westinghouse Air Brake Co., Westinghouse Electric Corp. now owns 70 percent of the common stock of the Canadian firm. The Canadian company manufactures and sells in Canada products of both American companies. In recent years the electrical manufacturing portion of Canadian Westinghouse's business has grown faster than its sales of air brake equipment. The sale of

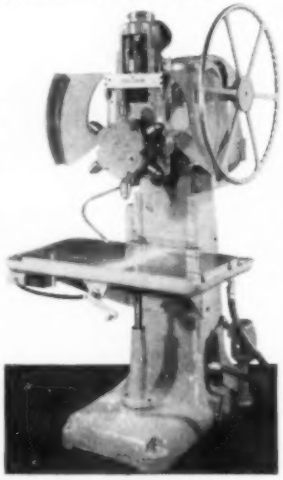


BURGMASTER® Turret Drills

Give 45% Time Savings on

Missile Parts at Rheem Manufacturing Co.

Installation of ten 6-spindle Burgmaster POWER INDEXING Turret Drills with preselective spindle speeds and stops at Rheem's Aircraft Division has resulted in 45% time savings and has reduced rejects to less than 3%. Quality of the drilling, tapping and countersinking operations on missile and aircraft components of steel and aluminum has substantially improved. All operations are to close tolerances. The holes with Class 3 thread are held to .0018". Also, recentering is not necessary as tools are accurately centered, preventing bell mouthing. After each operation the next spindle automatically moves into position as the turret head indexes quickly by power from station to station. This permits a number of operations to be performed on a part without moving it from one machine to another, with resultant decrease in machining time.



Write Dept. TE-11 for descriptive literature.

BURG TOOL
MANUFACTURING COMPANY, INC.
15001 S. Figueroa St., Gardena, Calif.
New York — Burgmaster Eastern Sales Division
15 West 44th Street
Chicago — Burgmaster Machinery Co.
5329 Lincoln Avenue

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-194

stock represented an adjustment of the interests of the two American companies in the Canadian organization and reflects the ratio of its manufacture and sale of their respective products.

V V V

Allied Metal Treating Corp. has acquired facilities of Wesley Heat Treating Co. of Manitowoc, Wesley Metal Treating Co. of Racine, Spindler Metal Processing Co. of Racine, and Capitol Heat Treating Co., Inc. of Racine.

V V V

The mill in Bridgeport, Conn. which has been part of The Stanley Works has been acquired by three officials of the Solar Steel Corp. and is now identified as the Precision Steel Corp. Sol H. Friedman, Daniel A. Friedman and J. B. Ribakoff made up the purchasing group. Mr. Sol Friedman is president of Solar Steel and will also assume duties of president of the new acquisition. Operating personnel of the Precision plant is being retained by the new owners.

expansions

A $¾-million expansion of its aeronautical engineering and research facilities is scheduled by Minneapolis-Honeywell Regulator Co. Work is starting on the three-story, 45,000 sq ft addition to the present aeronautical engineering building, with completion expected by next spring.

V V V

Federal Products Corp. has increased its manufacturing space by 24,000 sq ft with the occupation of a building on Oxford St., Providence. Because of the increase in area, the company is realizing faster delivery, better customer service and improved operations. Primarily the additional space was used for in-process automatic sorting and machine control gaging equipment.

V V V

Biddle Screw Products Co., Sheridan, Ind. has completed a plant expansion program involving more than $250,000.

V V V

A major expansion has been completed for Beryllium Corp. Most of the $2,000,000 facility is in new processing equipment which modernizes and increases by 60 percent the wrought alloy finishing capacity of the company. Included in the expansion are a $450,000 extrusion press that will produce seam-

beryllium copper tubing and special shapes; a $160,000 Sendzimir cold rolling mill that permits production of thinner gage strip to close tolerance in commercial widths almost twice that previously available; and a $100,000 direct reading spectrometer that automatically analyzes foundry samples for as many as 12 metallic elements while the heat is still in the molten state.

V V V

Rem-Cru Titanium, Inc. has purchased a group of five buildings from the Crucible Steel Co. of America as another step in its expansion program of tonnage production of titanium mill products.

V V V

Standard Tool Co. has opened a new Detroit factory branch at 10731 Puritan Ave. The building contains district sales offices and warehouse.

V V V

Construction is under way on a new 160,000 sq ft machining and heat treating plant for the Fafnir Bearing Co. on a 100-acre site in Newington, Conn. Estimated cost of the new facility is $11½-million. The building, which is scheduled for completion during the last half of 1956, is within 5 miles of the company's existing plants so transfers of personnel are not expected to cause any hardship.

V V V

A new factory has been opened by The Colson Corp. at Elyria, Ohio. Feature of the facility are the 400-ft long removable walls on two side which can be removed when adjoining sections are constructed later. This will afford open bays, and parts of the removed walls will be used then as outside walls of the new structures.

new activities

Micrometrical Development Corp. has made its services available for development of instruments for measuring displacements and surface characteristics and similar type assignments. The services include design, development, building and testing of complete electro-mechanical instrumentation.

V V V

The Industrial Products Div. of Johns-Manville Corp. is being split into three operating divisions which will comprise a new industrial products group. The three divisions will be identified as the Industrial Insulations Div., Packings and Friction Materials Div.,

HAVE YOU HEARD ABOUT THIS EXTRAORDINARY CLEANER?

It saves money in paint shops!

Oakite Rustripper is an alkaline material that strips paint, pigment residues and phosphate coatings from steel at the same time that it removes rust and oil.

It saves money in plating shops!

Oakite Rustripper removes rust or heat scale from steel at the same time that it removes oil and other soils. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

FREE

For more information about how Oakite Rustripper eliminates operations in paint shop and plating shops, send for one or both of the illustrated booklets listed in the coupon.

Here's the best shortcut in the field of organic finishing
RUSTRIPPER
Here's the best shortcut in the field of electroplating
RUSTRIPPER
OAKITE PRODUCTS, INC.

Technical Service Representatives in Principal Cities of U. S. and Canada

•

Export Division Cable Address: Oakite

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

OAKITE PRODUCTS, INC.
58 Rector Street, New York 6, N. Y.

Send me free booklet checked below:

☐ "Here's the best shortcut in the field of organic finishing"

☐ "Here's the best shortcut in the field of electroplating"

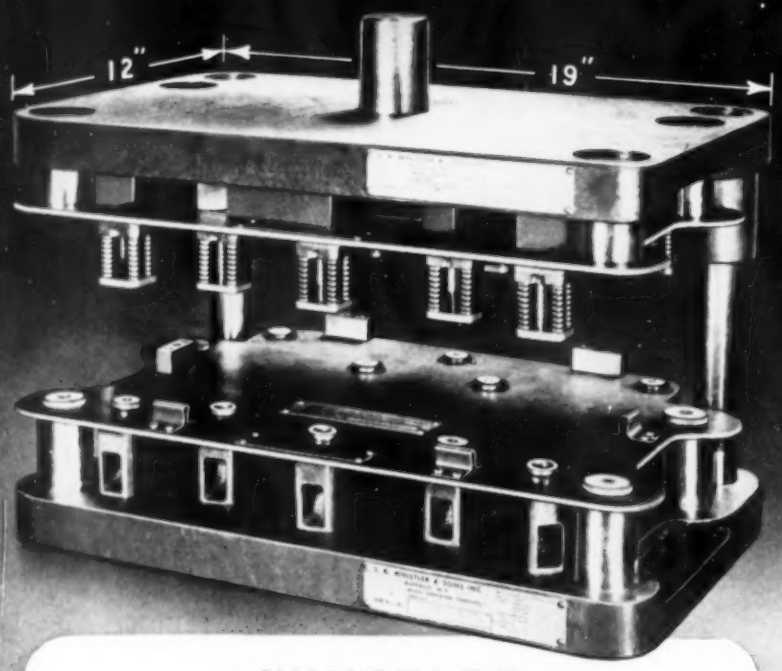
Name _____

Company _____

Address _____

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-195

SPECIAL INTRODUCTORY UNIT



WHISTLER

10 HOLE MAGNETIC PERFORATING DIE

Cut die costs drastically, start production quicker

This M-12-14 Complete Introductory Unit includes a set of blank templates, ten punches, dies, strippers and punch and die retainers complete to make up a ten hole precision perforating die. Any diameters from ⅛" to ½" to your selection. Catalog illustrates additional re-use economies

$675 NET F. O. B. OUR PLANT

WHISTLER DIES ARE CUTTING COSTS FROM COAST TO COAST

SEND FOR CATALOG Illustration shows how quick and simple it is to set up a Whistler Magnetic Perforating Die ready for production. Larger standard units can be added to suit your requirements.

S. B. WHISTLER & SONS, INC.

Manufacturers of Adjustable, Magnetic and Custom Built Dies for All Industry

744 Military Road **Buffalo 23, New York**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-196

and the Pipe Div. each will be headed by a general manager and staff. This expansion in organization, which will become completely effective January 1, continues the decentralization of operations which the firm has been carrying on for the past several years.

V V V

Titanium alloy extrusions are now being fabricated by Harvey Aluminum on a production basis. Sections being extruded are in lengths from 10 to 12 ft in alloys 4A1-4Mn, 3A1-5Cr, 3% Mn complex, 6A1-4V and 5A1-2.5Sn. At present the entire volume is being shipped to airframe manufacturers. Similar to steel in appearance, the titanium extrusions offer advantages of light weight, high strength, noncorrosiveness and excellent properties at elevated temperatures.

V V V

A special section of its organization to write, illustrate and publish operation and maintenance handbooks for industry has been established by Kenneth A. Young Associates. Extensive experience of the company's personnel in plant engineering departments, industrial plant design and industrial handbook preparation fostered the new activity. At present it has embarked on a project that is expected to result in 23 such books.

moves

Offices of Continental Sales and Engineering Co., representatives of The Automatic Switch Co., have been transferred from Smithfield St. to 211 Nelbon Ave., (P.O. Box 10505) Pittsburgh 35, Pa.

V V V

Perfection Spring Mfg. Co. has opened its new plant at 3354 N. Pulaski Rd., Chicago.

V V V

Branch offices of Vascoloy-Ramet Corp. have been located in new quarters at 4346 Germantown Ave., Philadelphia 40, Pa. The move provides the larger offices needed for the branch as well as more room to maintain stocks. Edward J. Wunderlich is in charge of the new offices.

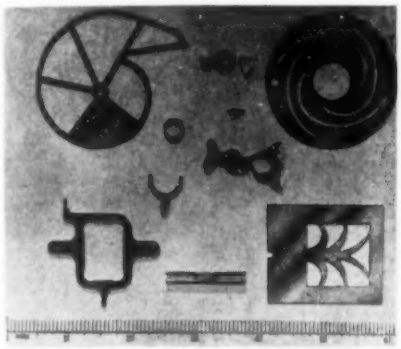
V V V

New York City offices of The Torrington Co. have been moved to the Port Authority Bldg., 111 Eighth Ave. at 15th St. Charles T. Spalding is manager of the offices. C. W. Dietrich, Jr. is the district engineer in charge of bearing sales.

Technical Shorts...

TINY METAL PIECES such as fine watch parts or camera shutter elements are being produced from a new stamping process developed by Federal Tool and Mfg. Co. The method, which is a refinement and extension of accepted stamping techniques, turns out shapes with lateral sections thinner than the metal sheet stock from which they are stamped. Flat pieces or three-dimensional parts are produced as desired. Important aspect of the process is economy. Intricate cams and other parts for precise mechanisms are being made at unusually low cost. The method is equally economical for producing nonmoving parts or flat designs.

Stamping Method Produces Miniature Parts



Samples of small stampings produced by the new technique are shown with a 6-inch measure for reference.

* * *

DEVELOPMENT OF a new type sand core binding material by the B. F. Goodrich Chemical Co. brings to the foundry industry a possible means of reducing costs of high quality metal castings. This synthetic resin, called Good-rite CB-35, offers several advantages over other commonly used materials, particularly in the areas of baking, gas formation, collapsibility and resistance to overbaking. During the baking of a core containing CB-35, no curing or chemical action takes place. Baking is complete when water contained in the mix has been removed. Tolerance for overbaking is excellent with maximum baked physical properties obtained over a wide range of time and temperature conditions.

Core Binder Lowers Cost Of Castings

Other characteristics of the new core binding material are excellent shakeout properties, dimensional and storage stability, and nonirritating properties. Besides, air drying of the core prior to baking is not harmful.

They have been found to be satisfactory for use in casting aluminum, bronze, magnesium, malleable iron, gray iron, steel and stainless.

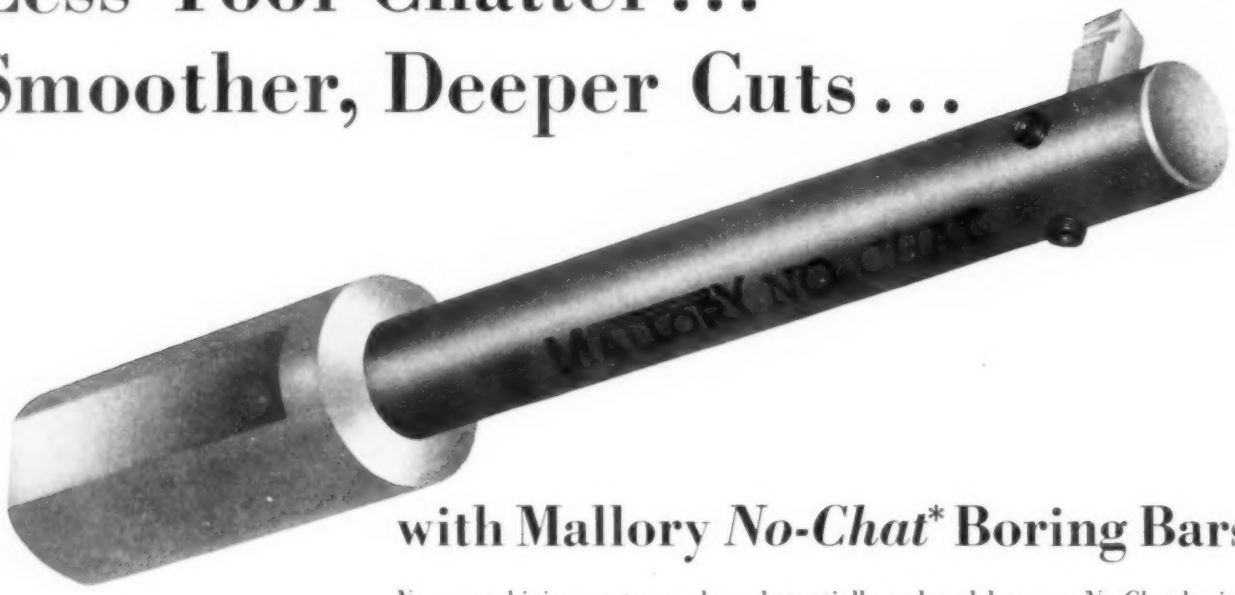
MORE THAN 15 YEARS of experience in casting plastic match plates, patterns and dies are reflected in the sound slide film show, "Tooling for Plastics with Hydrocal," now available from United States Gypsum Co. The film, which was produced in the interest of keeping pattern and tooling shops abreast of new developments, shows how to make models, mandrels and molds for plastic tooling and explains the techniques involved. The film requires 31 minutes of running time.

Film Describes Plastic Tooling Techniques

Arrangements may be made for showing the film by contacting the company's Plastic Engineering Dept., No. 139, 300 W. Adams St., Chicago 6, Ill.

SOCK
for the socket!
AIR
New
Rotor J-2L
Impact
Wrench
cuts time 23%
ROTOR TOOLS CLEVE-O
Formerly used electric nut setter for assembly of garden tools. Switch to Rotor J-2L Air-powered Impact Wrench cut job time 23%. Savings paid for tool in 12½ weeks.
New J-2L Impact Wrench is reversible . . . specially designed for minimum maintenance.
Find out how you can cut costs with the rugged, lightweight J-2L and other new Rotor Tools! Ask for Bulletin 41.
THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS
HIGH CYCLE
AIR
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-197

Less Tool Chatter...
Smoother, Deeper Cuts...



with Mallory *No-Chat** Boring Bars

Your machining costs can be substantially reduced by new *No-Chat* boring bars—a revolutionary development of Mallory research that practically eliminates tool chatter.

No-Chat boring bars . . . and tool shanks . . . are made of a completely different kind of alloy whose physical characteristics inherently stop tool vibration at its source. Twice as heavy and 75% more rigid than steel, they produce smoother finish even on deep cuts. Their higher price is repaid quickly, many times over, by these cost-cutting advantages:

HEAVIER CUTS—Because chatter is greatly reduced you can set machines to remove more metal per pass.

SMOOTHER FINISH—Clean cuts often require no finish grinding.

LONGER LIFE BETWEEN GRINDS—Cutting edges last longer, due to reduction of vibration. And tools run cooler, for the *No-Chat* tool conducts heat away from the tip three times as fast as steel.

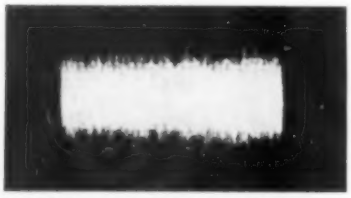
EASY BRAZING—Cutting tip can be brazed readily to the bar with any of a variety of brazing alloys. *No-Chat* is non-annealing . . . eliminates grain growth problems.

RE-USABLE—*No-Chat* boring bars or tool shanks can be used over and over with new tips.

We'll be glad to discuss how this new idea in machine tool technology can put new performance into the tools you use or manufacture. Write today for our Technical Bulletin.

TESTS PROVE HOW *NO-CHAT* REDUCES CHATTER

These oscillograms show the greatly reduced amplitude of tool vibration with *No-Chat* shanks, using identical machine set-ups, when taking a 0.030" cut in low carbon cold rolled steel at 450 SFPM.



With ½" steel shank and style C-8 bit.

With ½" *No-Chat* shank and style C-8 bit.

Expect more... Get more from MALLORY

*Trade Mark

Metals and Ceramics Division

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:
Electromechanical — Resistors • Switches • Television Tuners • Vibrators
Electrochemical — Capacitors • Rectifiers • Mercury Batteries
Metallurgical — Contacts • Special Metals and Ceramics • Welding Materials

Improvements in . . .

AUTOMATIC MATERIALS HANDLING

technical digests

By Ingram Richardson, President
Richardson Scale Co.
Clifton, N. J.

Automatic processes require remote indication, recording, totalizing and remote formulation. Thus, automatic weight control has become an important part in bulk materials handling. When materials have to be measured, they must be handled under perfect control from the storage bin through the process and to an accuracy of from a pound to an ounce according to requirements. With increasing use of statistical quality control the common tolerance is dropping to 0.25 percent and even 0.1 percent. This requires an efficient materials handling system.

Materials may be corrosive, abrasive, hygroscopic, toxic, inflammable or even radioactive, and these factors influence automatic scale design far more than hardness of a knife edge or sensitivity of a dial. Load sensing devices and instrumentation are useless until material problems are solved.

In handling material such as flour, a good solution to problems is to eliminate human judgment and manual dexterity, as in *Fig.* 1. The bin is tapered out rather than in so the material cannot arch. A live bin bottom feeding a take-away screw assures a positive feed.

There have been other noteworthy developments in feeding equipment recently. Pelletized rubber is a difficult material both to store and feed. In spite of soapstone and other treatment, it is impossible to store to a depth of more than three feet without the pellets sticking together. Yet the material must be stored in large quantity and fed automatically to scales ahead of the mixer.

One solution, *Fig.* 2, is a storage tower with retractable supporting plates every three feet. The two columns shown make 20 tons available to one Banbury mixer. Two slides, operated by air cylinders, move in and out automatically according to material level control switches, so that a one-ton batch will progress downward a step at a time without being subjected to more than a 3-feet head.

In another solution, *Fig.* 3, storage is horizontal. A stationary belt conveyor is loaded at the tail end by having the pile skimmed off by parallel screw conveyor without casing. To discharge the pellets the conveyor belt runs with the screw so that the mass advances to the automatic scale with the revolving agitator at the head end to maintain a uniform breakway. This conveyor can be reloaded without discharging and additional storage can be obtained by stacking one conveyor above another.

The load sensing device is still the brain of any automatic weighing system. The common beam scale is the original load sensing device and still the most accurate. Other devices, *Fig.* 4, must be used to provide the type of control required in many installations. From left to right, these include the dial scale, coil spring, load cell (electronic, hydraulic or pneumatic), the power-driven traveling poise and the deflection beam. The latter is a combination of spring and load cell. These devices permit application of all kinds of instrumentation, so installations can be furnished to meet the most complex requirements of the process engineer.

Fig. 1. Setup for inconsistent materials.

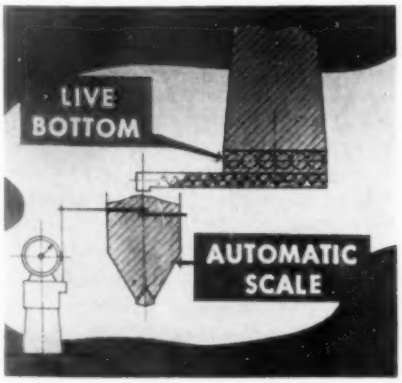
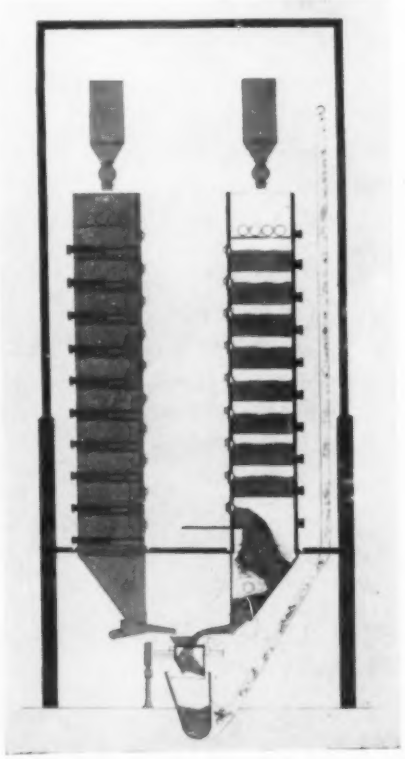


Fig. 2. Flow of granular material.



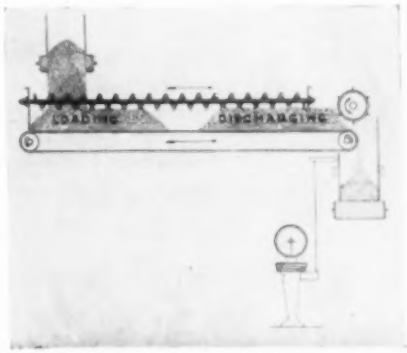


Fig. 3. Horizontal belt storage.

Some of the basic instrumentation devices are:

1. The analog indicator which indicates remotely the exact half of the pointer on a mechanical dial scale.
2. Digital indicator, a high-speed counter which totalizes graduations on a dial as fast as the scale pointer passes them in its accumulation of weight.
3. Circular chart recorder which will record the amount of ingredient or multiple ingredients cumulatively weighed.
4. Remote printer which records individual weighings remotely on a ticket or tape as they are made.
5. Totalizer which is a combination of adding machine (2) and printer (4) so individual weights are printed as they are made and a total becomes available at will.
6. Amplifying relay whereby all manner of mechanical equipment can be interlocked with the operation of a scale.

The important part played by automatic weighing in proportioning systems can be described by considering one major application. Such an installation is the compounding operation in a rubber mill room, *Fig.* 5. In this, 43 different ingredients are proportioned and delivered to a Banbury mixer under the direction of one operator in a distant control room. The materials include six grades of carbon black, nine different oils, twelve accelerators, eight pigments, and eight grades of pelletized rubber. The carbon blacks are delivered to their bins by pneumatic conveyor, and go to a batch hopper scale through vane feeders. The scale discharges directly to the mixer. The oils are fed by automatic valves to a steam jacketed tank scale having two compartments to prevent contamination between staining and nonstaining oils. This liquid scale discharges to a pressure chamber for injection to the mixer under 60 psi pressure. Accelerator, pigment and pellet scales are fed by electric vibrators. They discharge to a conveyor for delivery to the mixer.

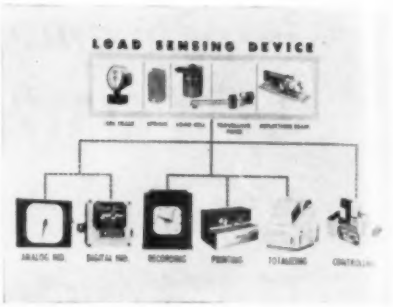


Fig. 4. Instrumentation for automatic materials handling.

Fig. 5. Compounding operation in a rubber mill room.

Automatic weighing seems inherently well suited to automatic or semiautomatic bulk handling installations. Weight sensing devices can always be made to supply a signal to any one of a wide variety of instrumentation devices. Integration of automatic weighing with computer control devices, for instance, is already a reality. As the new marvels of industrial control are unveiled, they can be applied to automatic weighing for still greater productivity and improved quality control in bulk materials handling by weight.

From a paper presented at the Materials Handling Conference sponsored by Westinghouse Electric Corp., Columbus, O., Feb. 1955.

ACME dowel pins

133
STANDARD SIZES
precision or oversized

Sizes range from 3/8" to 6" in length—1/8" to 1" in diameter. Precision pins are hardened and ground to .0002" or .001" over nominal diameter—oversized from .002" to .005".

Acme Pins are case hardened to 60-62 Rockwell "C" scale and core hardened to 36-38. These pins will break before bending or mushrooming—preventing misalignment or breaking of doweled parts. A special lubricant is used on pins to prevent scoring when being driven in and out of holes.

Order from your distributor—or write for Acme Dowel Pin folder and name of distributor nearest you.

ACME INDUSTRIAL COMPANY
208 N. LAFLIN STREET, CHICAGO 7, ILLINOIS
Manufacturers of standard dowel pins • Chamfer micrometer gages • Drill jig bushings • Portable bench centers • Roughness comparison specimens • Hardened and ground parts manufactured to order

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-200

hnical digests

ncreasing Effectiveness Management Engineers

By V. M. Gelin

Mgr., Methods and Standards
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.

In selecting management engineers, the branch of engineering which a prospective employee may have studied is of secondary importance. It is important for a good management engineer to have basic engineering training, but it is relatively unimportant whether this training was obtained in industrial engineering or in any other field.

Improving the effectiveness of management engineering work can be solved in three separate phases: The use of improved engineering techniques; creation of a favorable management and supervisory climate; and gaining acceptance by employees. These are either entirely within the control of engineers or susceptible to their direct influence.

Application of Training

After the initial training period, on-the-job training should continue regardless of how much experience and training the individual has had. All new developments in engineering techniques, which can be applied profitably, should be considered. This information includes: standard data, predetermined motion-time techniques, MTA memo-motion, application of statistical analysis and work sampling.

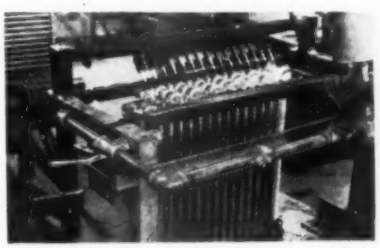
A system of internal cost accounting is an important step for any management engineering group. This system should be simple and should provide information on the cost of every activity of the group. In addition to cost control of the activities of the groups, it should also serve as a basis for work scheduling and for determining backlog and manpower requirements.

In a field of activity such as incentives, where so much depends on a great many people doing the right thing, audits are indispensable. Each engineer, as part of his job and responsibility for the area of the plant to which he is assigned, should make regular audits scheduled a year in advance to determine whether the standards measure the work and whether the work is reported correctly.

With sound engineering techniques and good administrative policies, su-

SIL-FOS
master joiner of
NON-FERROUS METALS

KEWANEE-ROSS CORP., Div. of American Radiator & Standard Sanitary Corp. use SIL-FOS in making ROSS Heat Exchangers. Here copper shell is torch brazed into bronze hub —31" around in only 5 to 6 minutes.



FEDDERS-QUIGAN CORP., use a lot of SIL-FOS 5 in assembling their FEDDERS Room Air Conditioners. Here 3 rows of return bends (40 joints) are gas-air brazed to condenser tubes at one time in less than 1 minute.

Yes, SIL-FOS has won the confidence and preference of thousands of manufacturers for joining brass, bronze, copper etc. because this low-temperature silver brazing alloy consistently makes joints *as strong as the parent metals – at surprising speed and low cost.*

The silver content does it – just enough silver to give SIL-FOS and SIL-FOS brazed joints these vital advantages:

LOW FLOW POINT– that cuts down heating time, labor and cost.

EXCEPTIONAL FLUIDITY – that assures instantaneous and complete penetration over the entire joint area for maximum strength, plus liquid and gas-tightness.

AMPLE DUCTILITY– to withstand all stresses and strains of vibration, shock and temperature changes the parent metals themselves will take.

HIGH CONDUCTIVITY– of electricity and heat.

HIGH RESISTANCE– to corrosion.

BULLETIN 20 may mean a lot of $ $ $ $ for YOU

It gives the SIL-FOS story in full. Write for a copy today.

Full technical and practical assistance is always available to users and prospective users of SIL-FOS without obligation.

HANDY & HARMAN
FOUNDED 1867 QUALITY SERVICE
ORIGINATORS OF EASY-FLO & SIL-FOS

HANDY & HARMAN

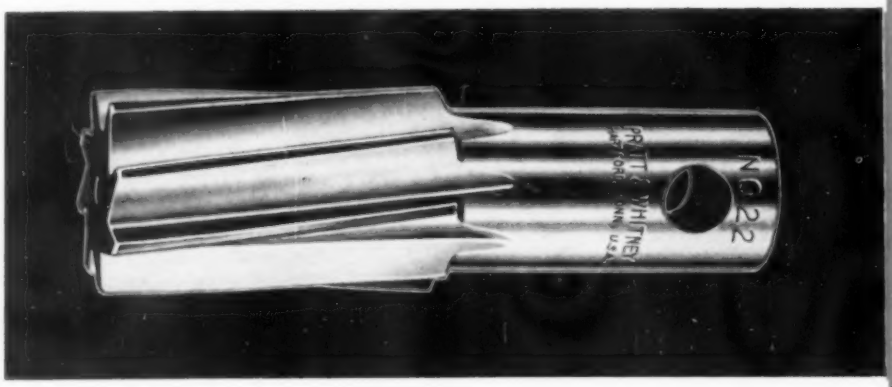
General Offices: 82 Fulton St., New York 38, N. Y.
DISTRIBUTORS IN PRINCIPAL CITIES

OFFICES and PLANTS
BRIDGEPORT, CONN.
PROVIDENCE, R. I.
CHICAGO, ILL.
CLEVELAND, OHIO
DETROIT, MICH.
LOS ANGELES, CALIF.
TORONTO, CANADA
MONTREAL, CANADA

There's no "...or equal" for EASY-FLO and SIL-FOS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-201

PRATT & WHITNEY
STUB
SCREW MACHINE
REAMERS



FAST, FREE CUTTING . . .

Correct design, with left hand spiral flutes, properly proportioned assures free cutting with ample chip clearance.

LONGER WEAR . . .

Distinctive P&W Special Surface Treatment gives superior resistance to chip abrasion. Smoother grinding finish provides maximum wear life.

SUPERIOR ACCURACY . . .

Cutting Diameter, Shank Diameter and Chamfer are held to rigid high standards of accuracy for both size and concentricity.

Available . . .

P&W Stub Reamers are quickly supplied in any decimal size from .060" to 1.010" because they're finished to your order from hardened blanks carried in stock.

USE THE COUPON BELOW TO SEND FOR YOUR COPY OF CIRCULAR No. 552 TODAY

PRATT & WHITNEY
16 Charter Oak Blvd., West Hartford 1, Conn.
FIRST CHOICE FOR ACCURACY SINCE 1860 MACHINE TOOLS • CUTTING TOOLS • GAGES

Please send my free copy of Circular No. 552

NAME_____
POSITION_____
COMPANY_____
CO. ADDRESS_____
CITY_____ ZONE____ STATE_____

pervisory and management support is still necessary.

The management engineering group should operate the same as an equipment or tool engineering group which installs a piece of equipment and maintains it for the operating department. But, it is the operating department's responsibility to operate the equipment properly. Also, the credit for all results obtained from the use of the equipment should go to the operating group. The supervisor of the area should have the same responsibility for operating the incentive plan as he has for operating the process.

Selling management is a never-ending job. When management first installs a management engineering program, it is usually well sold, it can see quick results and is satisfied. After good results have been attained, the higher costs which prevailed previously have a tendency to become forgotten, whereas the overhead cost of doing the work is constantly before them.

Management must constantly be reminded of what the incentive plan is worth and what return it is obtaining from its overhead expenditure.

Gaining Approval

Regular monthly reports showing results obtained should be a matter of course. In addition, an annual report is important, especially if it comes at a time when management is asking the ever-recurring question about the large overhead expenditures entailed in maintaining a management engineering group.

There are other less formal ways of selling management. One method is to keep them informed of any interesting studies or developments which show results in terms of lower cost or greater production.

Selling to the union and employees must be done just as intensively and with as many different approaches as selling to management. Basically, the employees are sold if what is done benefits them. This more or less corresponds to the formal selling of management but, as in the latter case, continuous selling in many other ways is necessary.

These ideas and practices can be helpful in enabling management engineers to accomplish more for the benefit of all.

From a paper, "How Management Engineers Can Accomplish More," presented at the ASME Management Conference, March 23-24, 1955, Cleveland, O.

What's Expected of Machine Tools?

By Rodger Emmert
Manufacturing Staff
General Motors Corp.,
Detroit, Mich.

Equipment and machinery are becoming more complicated and machine controls are increasingly more important. If all or part of a product goes through one large process machine, any down time on one of its units may mean interrupted production. Therefore, we need better components, better designs and more highly skilled maintenance employees. This suggests close cooperation between the machine tool builders and the users.

Some changes and improvements suggested for closer cooperation between machine tool builders and users are the following:

1. Machine tools capable of maintaining proper tolerances
2. More equipment that will permit an operator to produce more parts
3. Better ways of loading or passing parts from one operation to another without the aid of an employee
4. Machines which will automatically adjust to maintain size
5. Rugged, stiff and liberal machine design.

Engineers should publish in pamphlets standards and specifications of elements which they want incorporated in mechanical systems. These standards should cover not only details of arrangement but also the type of components desired in the system. Standards can improve safety and contribute to increased production due to more continuous operation of equipment with less down time for maintenance.

Among the improvements specifications seek to accomplish are:

1. Rugged components, such as limit switches, to stand up under production pounding
2. Locate components where they are not damaged by chips, coolant, oil and dirt
3. Locate and mount components where replacement can be made quickly and easily.

A survey of master mechanics for improving drilling, milling and turning machinery revealed the following for drilling machines: 34 percent recommended reducing maintenance; 27 percent improvement of accuracy; 21 percent greater flexibility and operating

You Save 4 Ways
WITH
PRATT & WHITNEY
MULTIPLE THREAD
MILLING CUTTERS
CUT THREAD OR GROUND THREAD

1 MORE REGRINDS PER CUTTER . . . thanks to P&W practice of maintaining the land width at the maximum practical limit.

2 MORE PIECES PER GRIND . . . because they're made only of carefully selected high speed steel and correctly heat treated.

3 ASSURED ACCURACY . . . which eliminates rejects. Each cutter is made accurately to the required specifications and carefully inspected; in addition, a test piece is cut and the thread form inspected with a high-magnification optical comparator.

4 FAST, FREE CUTTING . . . saves production time . . . due to correct P&W design with proper rake and relief for the metal being cut.

For prompt effective service, give one of our factory-direct Sales Engineers the opportunity to analyze your thread milling and other cutting tool needs. Just write or phone the P&W Branch Office nearest you . . . see list below.

BRANCH OFFICES AND STOCK . . . BIRMINGHAM* • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DALLAS (Southwest Industrial Sales Co.)
DETROIT • LOS ANGELES • HOUSTON (Tri-Tex Machine and Tool Co.)
NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER
SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD
* OFFICE ONLY

PRATT & WHITNEY
WEST HARTFORD 1, CONNECTICUT, U.S.A.

FIRST CHOICE FOR ACCURACY SINCE 1860 MACHINE TOOLS • CUTTING TOOLS • GAGES

ease; and 9 percent provisions for greater operator safety. Specific requests were for more rigidity, more positive depth control and better spindle lubrication. Spindle noses should be standardized for attachment of multiple heads.

Regarding milling equipment, the following suggestions for improvement were made:

1. Greater rigidity and strength
2. Centralization of lubrication system
3. Better means for chip disposal
4. Larger spindle nose
5. Higher spindle speeds
6. Greater spindle horsepower provided greater rigidity accompanies it
7. Improve spindle and feed drive to reduce chatter
8. Chip protection on moving parts, bearings and ways
9. Eliminate lubrication leaks.

The most prevalent suggestion received for the standardization of milling machines was for a uniform location of T-slots in the table.

Concerning turning equipment, the survey indicated that consideration should be given to those elements which affect:

1. Cycle of operation and quality of work
2. Maintenance
3. Stocking and service requirements

The results also showed a desire for the following improvements in turning equipment:

1. Increased power, speed and rigidity to eliminate chatter and permit optimum use of tungsten carbide tools
2. Improved chip handling and coolant cleaning
3. Eliminate overflow and splash of coolants
4. Improve alignment of indexing mechanisms and turrets
5. Improve safety features
6. Improve seals to keep coolant from getting into lubrication and hydraulic systems

Regarding grinding machines, the nose of grinding wheel spindles should be standardized. Lubrication systems should be all inclusive and complete so that bearings will be lubricated from central points, thus eliminating the probability that the lubrication of some vital bearing be missed. Dynamic balancing should be considered in the design of new machines because of the higher speeds and feeds.

New ideas and creative thinking are desired. Examples are the application of power indicators on heavy machine tools to indicate dull cutting tools or the machine is overloaded. Another is automatic gaging and feed-back of information for adjusting the machine to secure desired size.

Continual progress in the improvement of the means of production will, and must be made to increase capacity to meet growing markets.

From a paper presented at the National Machine Tool Builders Association Spring meeting, Edgewater Beach Hotel, Chicago, May 6, 1955.

▼ ▼ ▼

Advancement Through Effective Technical Reporting

By W. A. Ayres

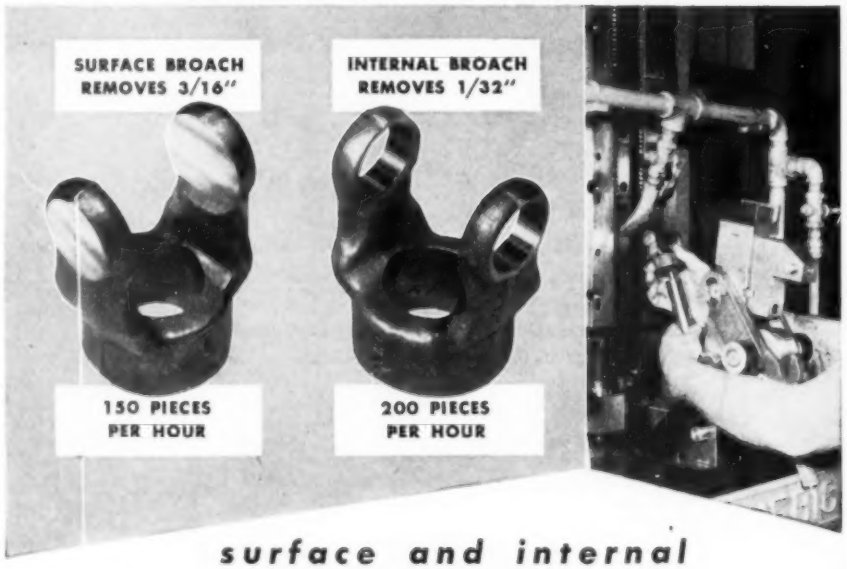
Dir. Research & New Product Eng.
White Sewing Machine Corp.
Cleveland, O.

Engineers have the opportunity of increasing their company's profits and at the same time earn rapid promotions.

This can be done by proposing improvements in the company's present products, or proposing entirely new products, provided the techniques of effective technical writing and speaking are mastered to sell management on the profit-making potentialities of proposals.

Engineers can invent and develop more new products than can be sold at a profit, but business management doesn't know about all of these possibilities. Engineers should sell their new products to management through the powerful selling tools of an effectively written proposal report plus effective speaking in its behalf to supplement the report.

one *American* broaching machine

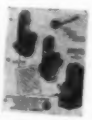


surface and internal broaching possible with *American* 3-way machine

To broach the lugs and cross holes of a universal joint, American engineers designed a combination tooling set-up on a standard American T-10-36 3-way machine.

Arranged with 3 stations, the machine surface broaches 3/16 stock off the inside and outside surfaces of the lugs at the center station; or broaches 1/32 off the I. D. of the lug cross holes at the two outer stations.

For more information on your particular broaching problem send a part-print or sample and hourly requirements. Address Dept. MM.



For more information on American Machines send for Catalog #300.

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-204

chnical digests

The following suggestions will help ginality and to perceive ways in ich a product can be improved or a w product created: (1) think of a sic human need or desire. Write own the factors of the ideal product hich would completely fulfill this human need. Don't worry yet as to how to devise such a product. (2) Compare this analysis and statement of the ideal product with those already on the market to highlight opportunities for improvements. Sources of information are included below.

1. Technical journals 2. Technical societies 3. Trade Associations 4. Books —Cumulative Book Index 5. Index to: Technical Magazines, Industrial Arts Index 6. Engineering Index 7. Chemical Abstracts (summaries) 8. Science Abstracts (summaries) 9. Readers Guide to Periodical Literature 10. Vertical File Index—Pamphlets 11. New York Times Index 12. Patents 13. Public Libraries and General Catalog 14. Special Libraries Association 15. Authors 16. Famous men 17. Moody's Industrials 18. Thomas' Register of Manufacturers 19. City Directories 20. Government Publications.

During the research and study phase of the report be constantly alert to obtain copies of anything which will make exhibit material. It is worth while to buy copies of magazines or newspapers containing articles important to the report.

Proposal reports contain special problems, and should be constructed to meet them effectively.

State the essence of the proposal briefly first. This section can be in the form of a summary, conclusions, recommendations, or preface. Include an expanded table of contents to act as an outline of the report. Put supporting detailed technical data in an appendix to shorten the report. Provide an acceptable answer for every obvious problem involved. Solid pages of text are deadly and should be broken up with illustrations. Write each major fact or idea on a separate index card and regroup and rearrange them for the best outline sequence.

Care in perfecting all details gives the final essence of quality to a report, and serves in itself as a recommendation.

From a paper "Increased Profits through Effective Technical Writing and Speaking" presented at the 12th Machine Design Conference of the Cleveland Engineering Society, Feb. 1955.

▼ ▼ ▼

How to Get the Most from Computers

By Dr. Jay W. Forrester

Director Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge, Mass.

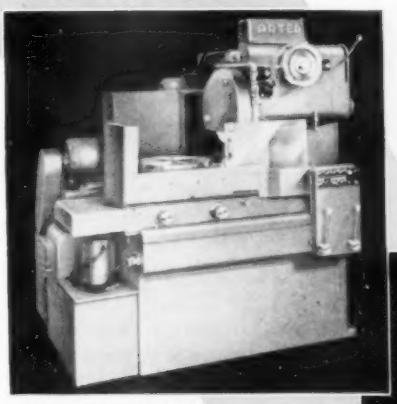
During the past decade the speed of electronic data-handling machines has increased by a factor of nearly 100,000; high-speed internal storage capacity has increased by a factor of 100 or more; the reliability has improved by at least a factor of 100. At the same time the complexity has not changed appreciably. Perhaps the most spectacular improvement has been the reduction in the unit cost of computation. A task consisting of a million desk calculator operations, which might cost $30,000 by hand, can now be carried out by electronic machine for $30 or less.

Other recent developments include availability of machines aimed specifically at commercial applications as distinguished from scientific computations; improved types of tape and disk magnetic storage devices; and use of transitors. Others are improvements in data transmission by telephone line and new high-speed mechanical and electronic printers.

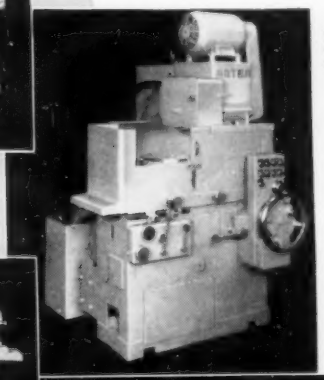
Management is being offered equipment which, if efficiently used, operates 100,000 to 1,000,000 times faster than manual methods. The pace of the transition to new data processing equipment will probably be set by the rate at which new business executives can be devel-

ARTER FAMILY OF GRINDERS

A GENERATION of experience stands behind the ARTER family of grinding machines. Progressively these machines have attained advanced techniques, simplification of grinding processes, closer tolerances. Today ARTER is proud of the family especially the newest members, Models E and F Rotary Surface Grinders.

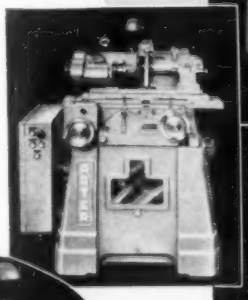


MODEL E—12" AND 16" ROTARY SURFACE GRINDER

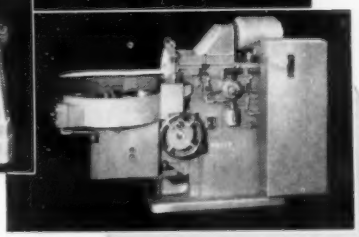


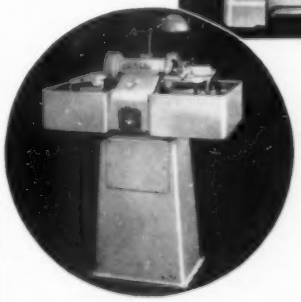
MODEL F 12" ROTARY SURFACE GRINDER

MODEL D—SPECIAL SEMI AUTOMATIC ROTARY SURFACE GRINDER ARRANGED WITH WORK-LOADING AND PUSH BUTTON GRINDER CYCLE



MODEL 103—CYLINDRICAL AND INTERNAL GRINDER





MODEL 200 CARBIDE TOOL GRINDER

ARTER GRINDING MACHINE CO.
WORCESTER • MASSACHUSETTS
Agents in industrial centers of United States and Canada

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-205

oped with an understanding of the potentialities of the new machines.

The principles of the electronic machines are easier to understand and learn than are the principles and objectives of the business to which they are applied. Obtaining trained staff men in the use of new electronic data processing machines should be viewed by management as a long-term process. Full use cannot be made of such machines until they are generally understood by many persons in a company, and industry must do its part in educating them.

The cost of using electronic data processing equipment should not be evaluated only in terms of operating expense but rather against its effect on over-all company profit. Less money in the future will be spent than in the past for information collection, conversion, and interpretation.

Ordinarily the cost of preparing machine instructions falls in the range of $1 to $10 per instruction word. The cost of this planning and computer program setup usually is about the same as the cost of the equipment itself.

Three categories in which electronic machines can be of benefit to business are simple cost reduction, wherein present methods are satisfactory but more expensive than necessary; indirect assistance to management by making information more timely and valuable; and the direct use of computing machines as an aid in making management decisions. This last category, the most challenging, includes the solution of problems in operations research, the solution of problems in linear programming, and the use of computers for making timely projections and forecasts based on current events. This is the next big area to be developed and should be studied just as the applications to clerical tasks have been studied in the last few years.

From a talk given at the American Management Association Conference, Hotel Roosevelt, New York, N. Y., May 23-25, 1955.

▼ ▼ ▼

Organization Flexibility Aids Industrial Change

By Charles B. Thornton
President, Litton Industries, Inc.
San Carlos, Calif.

Acceleration of industrial change has created a demand for organizational flexibility and specialized knowledge in a variety of fields. It requires establishment of an environment so that the whole organization is oriented to accept change.

One company found that the best way to organize for change is to organize around the specialists as individuals—that is, key people who have the abilities to accept responsibility for their own specialty and have the capacity to consider the division problems as a whole.

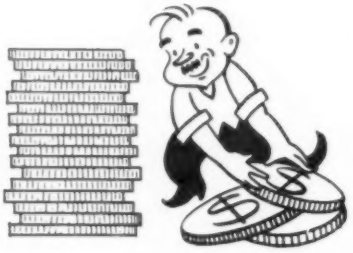
Product research and development, product engineering, sales, and manufacturing are decentralized into operating divisions which are generally organized around product line groups that are each of such a size and complexity to maximize the personal motivation and effort of the key people. If an operating division is excessively large and stimulation provided by the enthusiasm and satisfactions of key personnel will be lost. However, the division must be large enough to justify the key personnel organization.

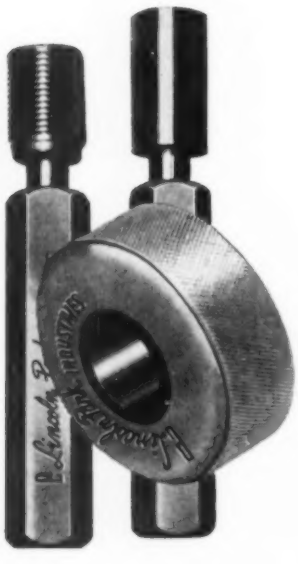
Getting Teamwork

Having a balanced team of specialists can guard against excessive domination by any particular group. Proximity of key personnel of different specialties in an integrated division permits them to interchange new ideas. They develop a respect for each other's contributions that is often difficult to obtain when a division is organized around functional lines, particularly when the division is large.

This key person type of organization also is helpful in developing more rounded scientists, engineers and business specialists. Many newer technological advances have resulted from the interchange of two specialists in different fields being brought together on the same problem. Often in some or

Consider What YOU Will Save with Lincoln Park CARBIDE GAGES





. . . "a lone $38 carbide gage saves us $4000.00 a year"—"we cut gage checking expenses $20,000 annually with carbide gages"—"our initial gage costs were reduced $1,280.00 in nine months on a single part inspection."

These are statements backed by actual records of Lincoln Park customers. And they are not unusual—for throughout industry similar reductions in inspection costs have been and are being effected by the use of Lincoln Park carbide gages. Savings in gage replacement . . . less gage checking . . . more parts passed because of closer gaging tolerances . . . all are factors contributing to these lower costs.

Take a look at your gage applications and see what you might save by using carbide gages. Then call on Lincoln Park—the company that pioneered the use of carbides in gage manufacture—to meet your needs *exactly!*

THE PLUS IN PRECISION
Lincoln Park INDUSTRIES, INC.
1719 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-206

izations the mechanical engineer
ks only to the mechanical engi-
rs.

To keep the key personnel informed
the corporate perspective, there
uld be frequent meetings of such
rsonnel from all divisions. Each in-
ividual should make suggestions and
xpress ideas concerning any part of
the company, its policies, or its plans
for the future. Such meetings can give
rise to new products and new programs.

Organization of this type also helps to bring together individual and company goals, by providing an opportunity to participate in the setting of direction of the division and in selecting the particular areas which will help bring about industrial progress.

From a talk given at the American Management Association Conference, Hotel Roosevelt, New York, N. Y., May 23-25, 1955.

▼ ▼ ▼

Reaching for the Seventh Decimal Place

By Louis Polk

President
Sheffield Corp.
Dayton, O.

Man's industrial progress has been made possible by an increasing ability to machine and divide the inch and the meter out to the seventh decimal place, and even beyond. The real opportunities for growth in the machine tool industry lie as much in improving the output quality of machines as increasing their quantity output.

The Angstrom unit, about one four-billionth of an inch, is a good example. Though it measured physically, it's useful in explaining certain phenomena in electronics. Similar examples exist in the nuclear field, where man's vision has conjured new units of measurement. One is the "jiffy," the length of time required for light to travel one centimeter. Today's fastest computers, for example, use up to 30,000 jiffies for a calculation. Another is the "barn" which measures the area of an atom. A barn is 10^{24} square centimeters or, expressed decimally, point, 23 zeros, 1. The term "shed" indicates 10^{20} square centimeters, or 1 millionth of a barn.

All or parts of the human body have served as measuring units since before history. They had the desirable attributes of being convenient and required no unusual skill. It was early realized that any unit of measurement should have the same value every-

"We've used that same headline every month since the plant started using Columbia EXTRA HEADER DIE!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Now Hardened Key Ways in Buck AIR CHUCKS

New Standard Feature Added to .001" Precision Ajust-Tru Chucks

Longer wear, longer accuracy — thanks to hardened key ways — is now added to other unique features of Buck Air Chucks. *At no extra cost!*

Now, more than ever, you'll want to consider *all* of the ways the Buck can save you money.

Guaranteed .001" precision.

Jaws machined in the tool room, saving the down time of fitting on the chucking machines.

Hardened jaws can be used for all operations with the Buck.

Accuracy adjustments made under full air pressure.

6", 8", 10" and 12" sizes — 2 or 3 jaws — NO PRICE PREMIUM. Send for literature today.

Buck AJUST-TRU CHUCKS

The Buck Ajust-Tru principle is unique. Jaws grip work like any other air chuck. After work is gripped opposed screws near the back of the chuck are used to move the chuck on the adapter to bring the work to alignment within .001".

Buck TOOL CO.
1133 SCHIPPERS LANE
KALAMAZOO, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-207

where. There exists a few millionths of an inch difference between the American, British, and French inches, but progress is being made to rectify this. Such progress is important, because the basic dimensions should be the same. Otherwise, the basis foundation of measuring systems have an intrinsic built-in error which multiplies itself as it travels farther from the respective Governmental Standards Bureau in each country.

Engineers are recognizing the need for agreement in basic accuracy between plants and departments within the same plant, an dof course the same need exists, merely on a larger scale, as between nations.

A plant's reference gages are usually made in another plant having its own gages, which were based on units of measurement certified by the National Bureau of Standard's Engineering Metrology Section. That, in turn, establishes the base in a series of reference gages and standards which make up the ascending echelons of precision manufacture.

Manufacturing managers, machinists and gage plant managers want maximum tolerances. Some practical problems are shown in the sketch.

If that tolerance can be improved, so much the more remaining tolerance for production. But since the Rule of Ten starts to operate normally with thousandths of an inch, it doesn't take many steps, using the 10 factor, before reaching the sixth decimal place. Today many production processes exist with ten-thousandths, or hundred thousandths, and occasionally even millionths.

An error in the original basic unit of measurement for production is compounded as it passes through each step toward and finally along the production line. An error of only a few millionths at the start can easily balloon into an error of several thousandths in the final product. That becomes important where parts must fit and work with other parts. Some machine tools and measuring equipment are manufactured which economically produce and classify parts for selective assembly, on the basis of ±5 millionths of an inch or less.

If a part is to have that precision, with 90 percent of that tolerance for manufacture and assembly, then by the Rule of Ten, the gage should be accurate to plus or minus one-tenth of that, or one millionth. But the gagemaker also works to standards. If the Rule of Ten also covers him, he brings us to the seventh decimal place. Already practical requirements in the aircraft industry call for that now, as maximum performance and safety must combine with minimum weight.

Why Greater Precision

There should never be close tolerances merely for their own sake. Rather, the goal is production at the widest tolerances permissible with required performance plus needed interchangeability for manufacturing and maintenance. As our performance standards are raised, often precision standards must be raised which sometimes means narrowing permitted tolerances.

These are among the reason the National Bureau of Standards and some foreign Bureaus found it necessary to progress toward the seventh decimal place. The purpose is to improve the national standards, and through them, by the descending echelons, to reduce the risk of any readily avoidable inbuilt error at the production level.

Measured in a vacuum, there is a change of 3 ten-millionths of an inch for the length of a 1-inch steel gage. Surrounding temperature and temperature change become important, as does even the index of refraction of air. These are typical of the problems encountered in progress toward a basic foundation of measurement accurate to the seventh decimal place.

Advancing the arts of machining and dividing and subdividing the inch and meter is an important key to advancing industry and civilization.

From a paper presented at the National Machine Tool Builders Association spring meeting, Edgewater Beach Hotel, Chicago, May 6, 1955.

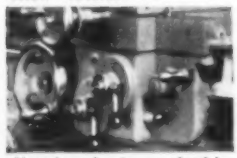
SHELDON CHICAGO U.S.A.

NEW Sebastian 13" A-5 GEARED HEAD PRECISION LATHE

Speed changes easily made by revolving speed dial on headstock

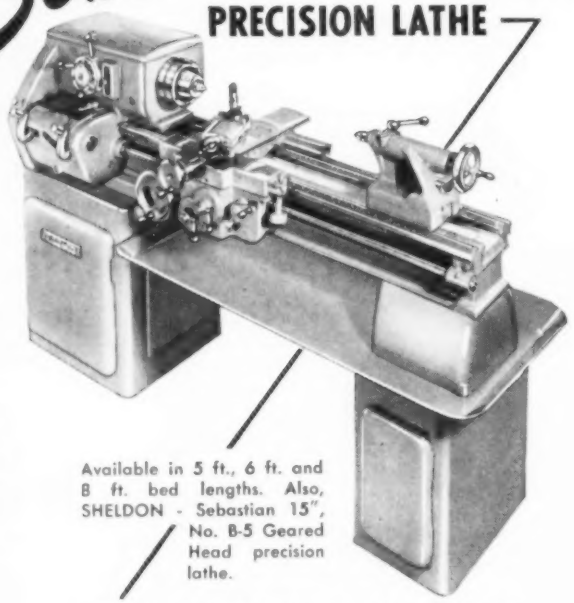
Heavy, multiple Splined Spindle with "Zero Precision" tapered roller bearings

Quick change Gear box provides 60 different threads or feeds — has built-in lead screw reverse



Massive 1-piece, double walled apron with gears running in oil has "1-shot" pressure lubrication system for carriage and ways

Cam action tailstock clamp permits rapid release and instant locking of tailstock



Available in 5 ft., 6 ft. and 8 ft. bed lengths. Also, SHELDON - Sebastian 15", No. B-5 Geared Head precision lathe.

This is a completely new Sebastian Lathe *designed and built by Sheldon* . . . a rugged work horse with extra power, toolroom accuracy and all the modern features that make for money-saving production . . . with all controls centrally grouped in easy reach for safe efficient operation.

Modern, heavy cast-iron pedestal (included in base price of lathe) completely encloses motor and drive . . . with storage space in tailstock leg for tools and chucks.

Run this new Sebastian lathe. Test its performance. You will appreciate the powerful cuts that this lathe can take. Write for circulars on 13" and 15" Sebastian lathes and name of nearest dealer where you can see and operate these outstanding lathes.

SHELDON MACHINE CO., INC.
4206 N. Knox Ave., Chicago 41, Ill.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-208

How to Design for Production

By J. H. Conard

Chandler-Evans Div.
Niles-Bement-Pond Co.
West Hartford, Conn.

In his zeal to solve the functional problems of making a car more powerful or an aircraft fly higher and faster, the engineer is apt to forget that business exists to make a profit. The design of a product is important for production at minimum cost.

To achieve this goal, every detail of design must be considered, including a complete analysis of configuration, materials, surface finishes, methods and tooling. Each of these considerations must include the interplay of one upon the other.

The general configuration fixes the envelope in which the details must fit; fixes the stack-up of the subassemblies; determines the size, shape, and permissible tolerances of the details, and limits the methods of manufacture, assembly and measurement, as well as the tooling.

A necessarily complicated over-all mechanism should be broken down into as many simple, functional subassemblies as practicable to improve the manufacturing, assembly, and test or measurement costs. The general configuration of a current design should be related to both past and future design—to past design, for known production experience; to future design, for economy of future production.

The form of the material selected by the designer restricts the direct cost of manufacture, assembly and measurement, and markedly affects the tooling costs. Selection of the material form will vary with the expected volume of production. A choice between sand casting, permanent-mold casting, plaster casting, precision casting, shell-mold casting, die casting, forged or upset material, powder metallurgy, sheet or bar, must be weighed carefully.

The most economical form for high-volume production is often the least economical form for medium or low-volume production—thus, one might use sand castings for low volume; permanent mold castings for medium volume; and die castings for high-volume production. The operational or field service requirements of the mechanism will have a marked effect on economical choice of material type and form.

Surface finish specified by the designer plays an important part in the product cost. The rougher the allowable surface finish, the fewer finishing operations and the less the manhours required. Where finishes of 4 rms or better are specified, extra semifinishing and finishing operations will be required. Material selection, also, affects the cost of achieving a desired surface finish. It is much less costly to obtain a 16-rms finish on brass or aluminum than on Stainless steel. The designer should not specify a surface finish finer than that roughest surface which satisfies the operational and service requirements of the design.

Consideration of methods must include analysis of methods of fabrication, methods of assembly and methods of measurement. A design must be tailored to the limitations of production shop methods rather than the model shop. If production of the design is expected to be of medium or limited volume, the design should be tailored insofar as possible to available methods, machine tools, and tooling.

Standardization programs will provide helpful data to the designer to assist him in arriving at competitive design. Simplification of procedures will be a major help, taking away all routine functions that can be done by clerical or less talented design personnel.

The coordinated effort of the project engineer, design engineer, methods, production, tool engineers, test engineers and service engineers, will result in a far better production design than would the effort of the project or design engineer alone.

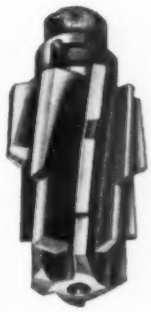
From a paper, "Designing for Production," presented at the ASME Machine Design Conference, April 6, 1955, New York, N. Y.

▼ ▼ ▼

In Defense or Peace

ECLIPSE *Specials*

. . . . ARE THE BEST BUY!



Eclipse Radial Drive High Speed Steel Cutter bores 5 diameters in steel part.

Special Cutter forms ball seat in road building machinery unit.

Tungsten Carbide Tipped Cutter precision bores three diameters in aluminum gear case.

Radial Drive Tungsten Carbide Tipped Cutter bores gear pocket in oil pump.

Multi-diameter cutter with Tungsten Carbide Tipped inserted blades for boring, counterboring and chamfering.

Since 1913—through two wars and during the peace years—Eclipse has met the exacting and changing demands of industry for special purpose end cutting tools. What better test? What better recommendation? Our large modern plant can serve you, too. Send your problem to us, today!

ECLIPSE COUNTERBORE CO.
Founded in 1913
DETROIT 20, MICHIGAN
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-209

How to Save on Paperwork

By C. A. Hennessy

Lamson Corp.
303 Lamson St.
Syracuse 1, N. Y.

In industry the flow of papers is the official means of communication. Paperwork is like an iceberg—only the top eighth is visible. Most of the forms, cards, blueprints, etc. never reach executive offices. The submerged parts can many times be melted down and made to yield big savings.

An investigation will likely disclose a variety of forms, invented expediently and perpetuated expensively. For example, 23 different kinds of envelopes were used, addressed to the home office. A helpful technique in paperwork investigation is the "roadmap." This traces a typical order through every step. At each processing point all forms that are used are pasted on the map. This map can be a stimulating and educational tool.

Another technique is a 100 percent traffic count, that is, accounting for every piece of paper moved between selective departments in one day. It was discovered in one plant that it cost about as much to get overtime authorized to payroll as the overtime cost.

The second step in reduction of paper handling costs is to justify them. The squirrel instinct is still strong. In the justifying process the need for making and storing every piece of paper must be questioned. Outside of legal requirements record keeping is a liability that costs money. Departments which collect records with no market value are Sales, Advertising and Engineering. There is a calculated risk in disposing of records. If an order for a part is lost because it cannot be identified, chances are the company is better off. If the drawings, patterns and tooling had been kept all this time, sales would never have dared ask a proper price.

Fig. 1. Pneumatic tube speeds delivery of test samples to the laboratory.

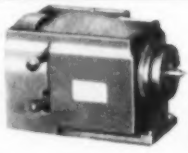
A third step is organization of flow of paperwork. This is often a matter of timing. The question is of little batches flowing smoothly against big batches piling up. Traffic jams in paper may be broken by a new timetable. Better scheduling permits an even flow of work being done by fewer people. The last step is to mechanize after the paperwork has been analyzed, justified and organized. Studies will show points of maximum paper generation and receipts. Sometimes paper is moved by relatively inexpensive messengers, but more often is moved by foremen who, in the meantime, neglect more important duties.

A variety of devices are available to carry written communications from one point to another. An example of a mechanical messenger is shown in the accompanying illustrations, for steel mill and foundry melt testing. In processing alloy steel is necessary to check the heat periodically to see if it is "done." A sample, *Fig.* 1, is sent from the melting floor to the laboratory for spectographic examination. The check is quickly made.

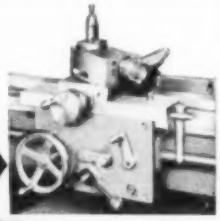
This is an instance where mechanization of sample handling has paid off in increased furnace output and better control. Such mechanical devices are used in a wide variety of industries for order taking, production, schedule handling, sample testing and the like. Mechanization of paper handling is one way to cut the cost, though only one-fourth part of the over-all technique.

From a paper presented at the Materials Handling Conference sponsored by Westinghouse Electric Corp., Columbus, O., Feb., 1955.

from its big ball-bearing spindle . . . .



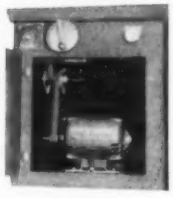
. . . . to the precision carriage . . . .



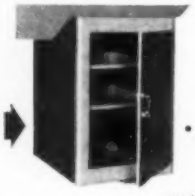
along its rugged, accurate bed . . . .

to the tailstock . .

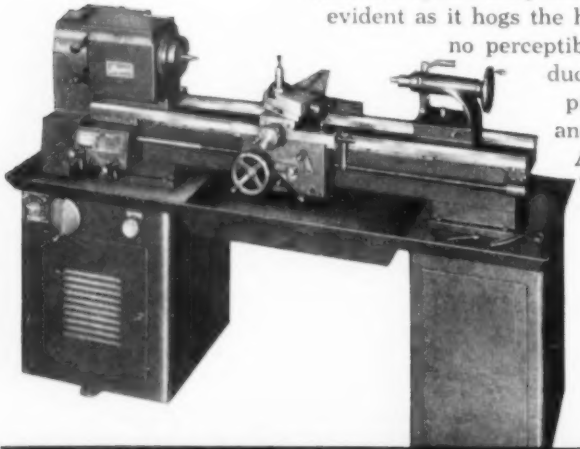
. . . . and down to the variable speed drive . . .



and its solid, strong, convenient cabinet



. . . . the No. 6560 Logan 14" Lathe is ruggedly proportioned, precision built and dynamically balanced. Its superiority is evident as it hogs the heavy cuts with almost no perceptible vibration, and produces precision results in production, maintenance and tool room operations. At your Logan dealer's. Write for Bulletin 14-L.



SPECIFICATIONS AND FEATURES

14⅝" swing over bed
9" swing over saddle
1⅜" spindle hole
1" collet capacity
40" between centers
Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm

LOGAN ENGINEERING CO.
4901 WEST LAWRENCE AVENUE • CHICAGO 30, ILLINOIS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-210

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr ECONOMATION

Performs 23 operations every 18 seconds on automotive intake manifold!

This Buhr 5-way dial-type hydraulic-feed Special mills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross.

The Machine is equipped with a Buhr 60"-diameter 6-position automatic index table, complete with shot bolt.

Chips are disposed automatically by means of a rotating chip conveyor.

Parts are loaded one per station in each of the six single-place fixtures. Power wrench with torque-control, automatically operates clamping mechanism.

Buhr's precision manufacturing methods provide complete interchangeability of all parts and component assemblies.

Buhr

MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

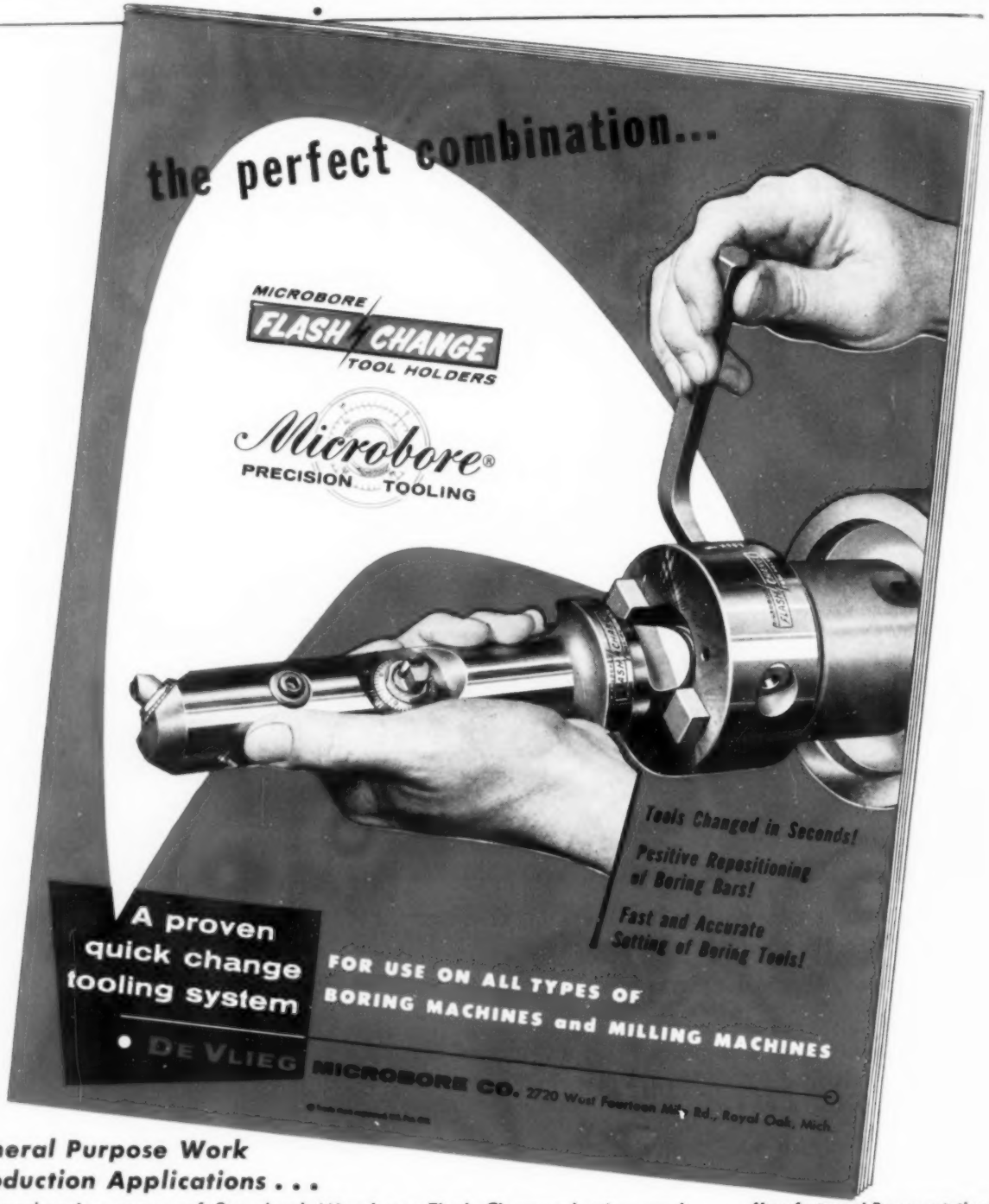
See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

DE VLIEG
OF DETROIT

brings you a new addition to the
Famous Microbore Line
OF PRECISION TOOLING


the perfect combination...
MICROBORE
FLASH-CHANGE
TOOL HOLDERS
Microbore®
PRECISION TOOLING
Tools Changed in Seconds!
Positive Repositioning of Boring Bars!
Fast and Accurate Setting of Boring Tools!
A proven quick change tooling system
• DE VLIEG
FOR USE ON ALL TYPES OF BORING MACHINES and MILLING MACHINES
MICROBORE CO. 2720 West Fourteen Mile Rd., Royal Oak, Mich.

For General Purpose Work and Production Applications . . .

- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.
- ***A new complete manual of application data to assist the tool engineer will be furnished on request.***

Manufacturers' Representative: A few desirable territories are being opened to qualified representatives. Please write for detailed information.

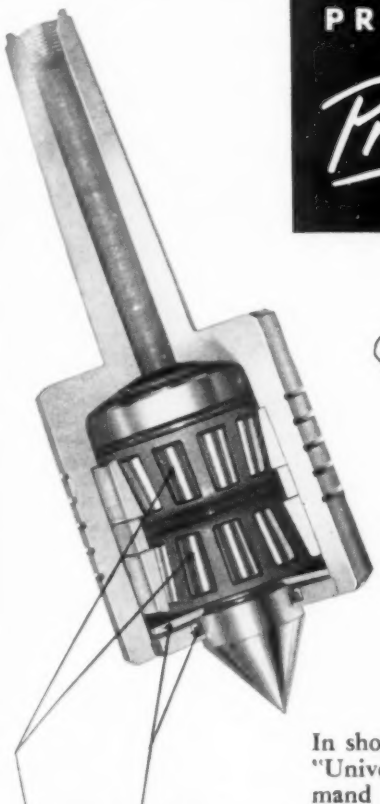
DE VLIEG MICROBORE CO. 2720 WEST FOURTEEN MILE RD., ROYAL OAK, MICHIGAN

IDEAL

PROVEN

Production Boosters

for the Machine Shop



IDEAL "Universal"

LIVE CENTER

PROVEN ACCURACY TO ±.0001" FOR A WIDE RANGE OF WORK

NEW DOUBLE SEAL
Stationary hycar sealing ring in cap keeps dirt out, slinger rotating with point keeps grease in.

PRE-LOADED BEARINGS
Twin, high-precision roller bearings are pre-loaded after center is assembled. Point is ground on own bearings for greater accuracy. All parts are hardened and ground.

In shop after shop, machinists have found IDEAL "Universal" Live Centers help them meet the demand for closer tolerances—and get more production at the same time. Extra load capacity permits the "Universal" to handle a wide range of lathe turning jobs, from very light loads to work up to 5200 lbs. Special construction features (see cutaway) insure accuracy to plus or minus .0001". Get premium performance without paying a premium—the "Universal" is moderately priced. Morse Tapers, 2, 3, 4 and 5.*

MULTI-DUTY MODEL

Interchangeable male, female and pipe points for all centered and uncentered work. Morse Tapers 1 to 5, also straight.*

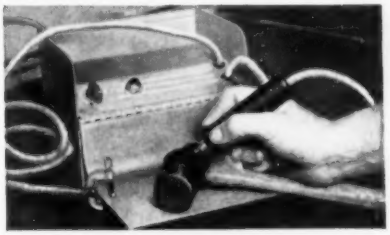
HEAVY DUTY MODEL

Extra rugged, to withstand extreme pressure of turning jobs up to 22,000 lbs. Eccentricity tolerance is less than .0002". Morse Tapers 4, 5, 6 and 7.*

***IDEAL Live Centers are also available with Brown and Sharpe and Jarno Tapers.**

IDEAL **DEMAGNETIZERS**

Quickly demagnetizes tools, punches, drills, dies or work from magnetic chucks. Prolongs tool life by removing harmful abrasive particles. Three models—for all sizes of work.



IDEAL **ELECTRIC ETCHERS**

Etches anything made of iron or steel or their alloys. Easy to use as a pencil. Burns smooth, permanent mark. Eliminates delay and expense of special name plates. Always ready—safe—portable. Three models for all types of work.

IDEAL **MARKERS**

Cuts a permanent mark into any material — steel, glass, plastic or hard rubber. 7200 cutting strokes per minute adjustable for depth. Anyone can use it—sturdy and durable. Operates from any AC outlet.

IDEAL **ELECTRIC TACHOMETERS**

Gives quick check on equipment performance-efficiency. Indicates shaft speeds in RPM. Hand type. May be used as single unit or with meter and generator connected by cord. Accurate to plus or minus 1% of full scale. Two models—2500 and 5000 RPM.

MAKE IDEAL YOUR DEPENDABLE SOURCE FOR SHOP EQUIPMENT. Your IDEAL distributor has complete stocks for quick shipment. Send coupon for free catalogs.

Sold Through Leading Distributors
In Canada: Irving Smith, Ltd., Montreal.

IDEAL

IDEAL INDUSTRIES, Inc.
4152 Park Avenue, Sycamore, Illinois

IDEAL INDUSTRIES, Inc., 4152 Park Avenue, Sycamore, Illinois IDEAL
Please send free catalogs on the items checked:

☐ Live Centers ☐ Demagnetizers ☐ Etchers ☐ Markers ☐ Tachometers

Name_____

Company_____

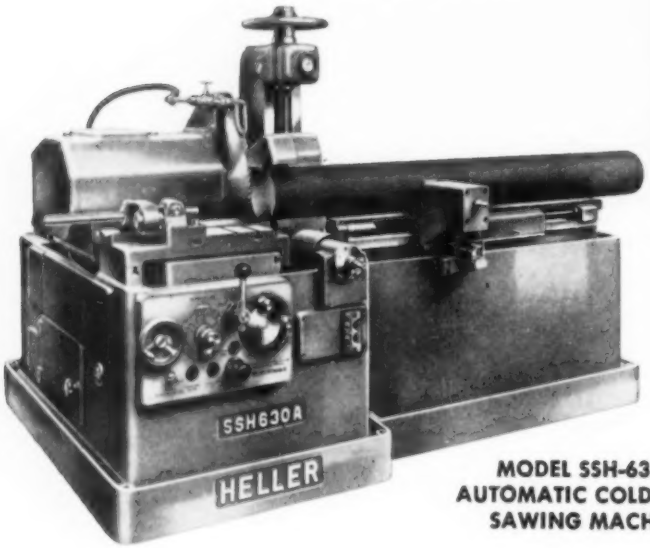
Street_____

City_____ Zone____ State_____

TRIPLE ECONOMY *WITH* HELLER SAWING OPERATIONS

WHEN YOU HAVE ALL THREE UNITS FROM ONE SOURCE

1 THE COLD SAW



MODEL SSH-630-A AUTOMATIC COLD METAL SAWING MACHINE

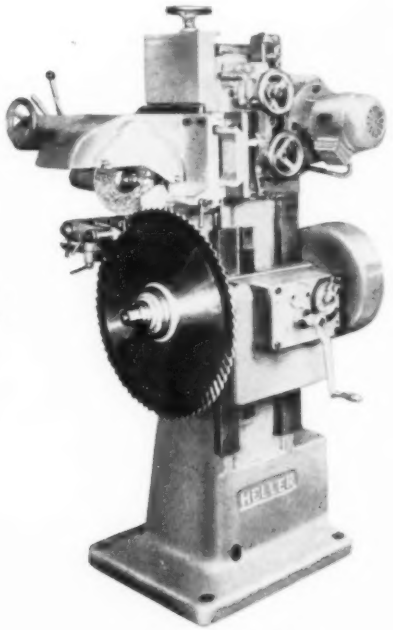
TRIPLE ECONOMY *with* HELLER

1. **The Cold Sawing Machine**
2. **The Blade Sharpener**
3. **The Circular Sawblade**

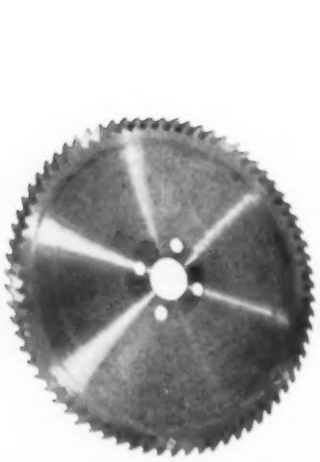
Economies are effected on every operation involved in cold metal sawing by taking advantage of the complete service available through Heller.

The specific savings offered by the use of the combination of Heller Cold Metal Saws, Heller Blade Sharpeners and recommended Sawblades becomes accumulative when used with each other.

2 THE SAW SHARPENER



MODEL B-650 AUTOMATIC SAW SHARPENING MACHINE



HELLER GIVES YOU COMPLETE SERVICE WITH EXACTLY CORRECT BLADES.

3 THE SAW BLADE

HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES

IN THE AUTOMOTIVE INDUSTRY, IT'S

UNION

UNION DISTRIBUTORS SERVE THE NATION

FOR
- SPEED
- ECONOMY
- RELIABILITY
- PERSONAL CONTACT

CALL YOUR UNION DISTRIBUTOR

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

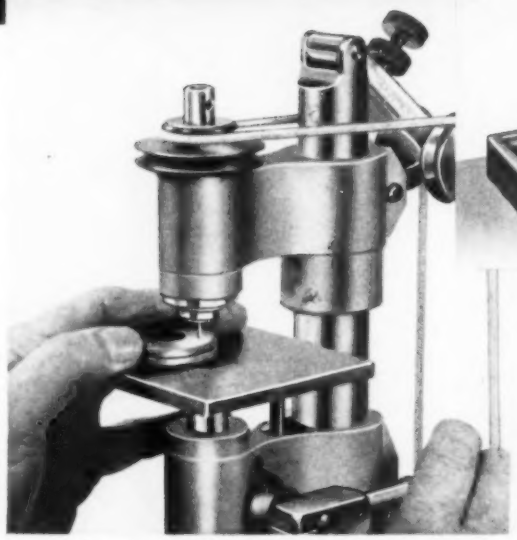
OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

SMALL DRILLS MUST BE HELD
IN PRECISION COLLETS TO ASSURE ACCURACY

LEVIN® MICRO-DRILL PRESS

FOR VERY SMALL HOLES
DOWN TO .002"

In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").



Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.

LOUIS LEVIN & SON, INC.
3610 South Broadway • Los Angeles 7, Calif.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-216-1

Want TO REDUCE SET-UP TIME?

In shops which keep close track of tapping and reaming set-up time, the Ziegler Tool Holder is in general use because of how it expedites the making of setups.

With the Ziegler Holder, set-ups do not have to be made to the same degree of accuracy as with ordinary tool holders. Just align the work to within 1/32" of center on the radius (1/16" on the diameter) and the Ziegler Holder automatically compensates for the difference. Try using the Ziegler on all of your tapping and reaming set-ups and see how it will reduce your tapping and reaming costs! PROMPT DELIVERY.

W. M. ZIEGLER TOOL COMPANY
13574 AUBURN DETROIT 23, MICH.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

USE READER SERVICE CARD; INDICATE A-11-216-2

TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 171.

TRUE-TRACE
HYDRAULIC
TRACER
CONTROLS

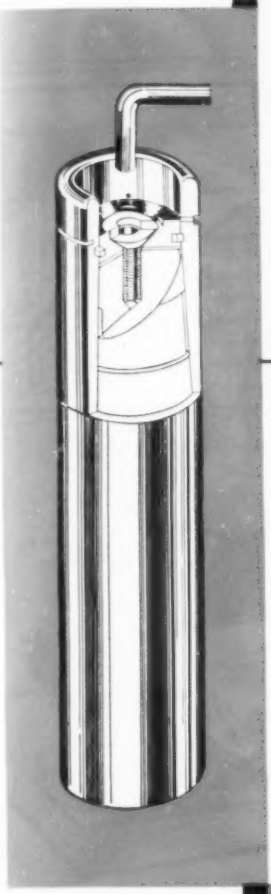
Application Engineering — Installation

Tomorrow's Tooling Techniques TODAY!

Specify machine tool application when requesting informative literature.

TRUE-TRACE SALES CORP.
EL MONTE 7, CALIF.
Call Collect—CUmberland 3-4761

USE READER SERVICE CARD; INDICATE A-11-216-3



One Man Removes Large Punch Holder in 3 Minutes!

with SUPERIOR

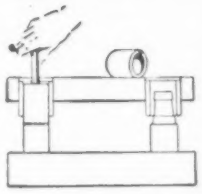
REMOVABLE CAP
GUIDE PINS

End Troublesome Binding in Die Set Assembly

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can easily do this work alone in a few minutes.

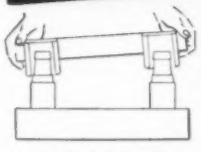
NOW OFFERED IN PIN DIAMETERS OF 1¼" UPWARD, AS STANDARD EQUIPMENT ON ALL SUPERIOR DIE SETS. SPECIFY IF DESIRED. WRITE FOR COMPLETE FREE INFORMATION.

FAST



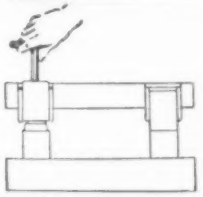
REMOVING CAP

SAFE

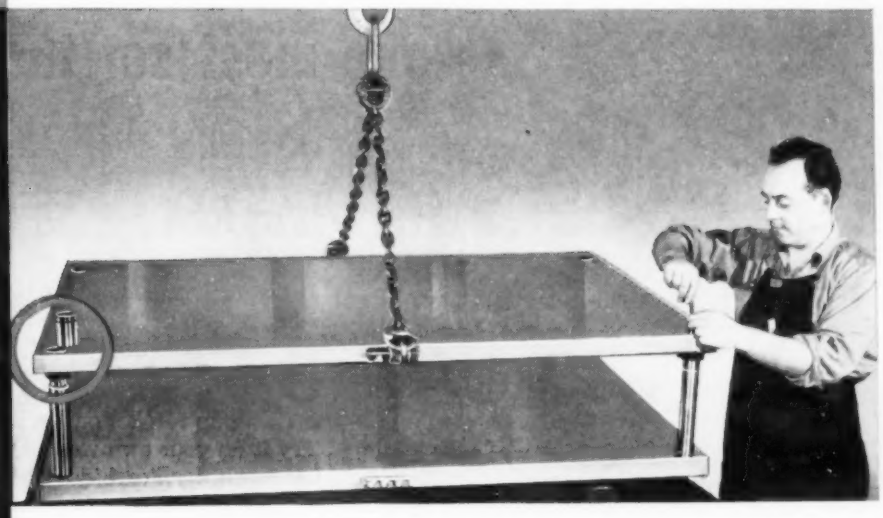


PARTING DIE SET

ACCURATE



REPLACING PUNCH HOLDER



For Fast Local Service Call These Expert Superior Representatives

Kalamazoo, Michigan — Phone 5-7988
Indianapolis, Indiana — BRoadway 5668
Chicago, Illinois — RAndolph 6-8871
Dallas, Texas — Riverside 5138
Rockford, Illinois — Phone 3-3932
St. Louis, Missouri — JEfferson 5-1223
Milwaukee — MItchell 5-6027
Dayton, Ohio — Hemlock 6209
Memphis, Tennessee — 3-7727
Cleveland, Ohio — KEnmore 1-2015
Eau Claire, Wisconsin — 2-3453
St. Paul, Minnesota — PRior 6485
Winter Park, Florida — 4-0464
Boston, Massachusetts — HUbbard 2-3373

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS

one must set the example

. . . and with high speed steel it's REX

It's a real satisfaction when you set the example by what you make . . . when it becomes a *standard for comparison*. That's why Crucible is proud to have kept REX high speed steel tops in its class for so many years.

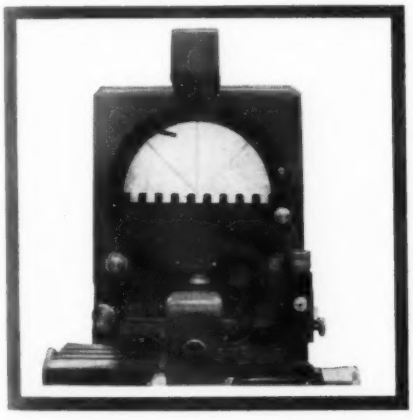
But don't take our word for REX's superiority. Try it on your own work. Compare its structure, finish, hardenability, carbide distribution and general uniformity. You'll see for yourself why it's the *standard* wherever high speed steels are used.

Remember, REX is made only by Crucible. So call for REX at your nearby Crucible warehouse, or for quick mill delivery — *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Saved . . . 296 pieces per thousand!



Like many another manufacturer, the Hoover Company, Canton, Ohio, has its rejection problems. A typical one involved a flexible, rubber-like "litter picker" used in its vacuum cleaners. Although tolerances ranged from .085" to .101", rejects ran as high as 30%.

To solve this problem, Hoover employed a Kodak Contour Projector to measure the parts, plotted results in accordance with modern methods of statistical quality control. Based on these studies, alterations were made in the cutting tool and the holding fixture for the part. Rejects dropped from 30% to less than ¼ of 1%. Savings amounted to 296 pieces per thousand.

"Optical gaging with the Kodak Contour Projector," say Hoover engineers, *"eliminated incorrect readings caused by mechanical distortion of the parts. In addition, optical methods of measurement proved from 4 to 5 times faster than conventional gaging techniques."*

Your own production measurement or inspection problem may similarly be solved by optical gaging with a Kodak Contour Projector. To find out more about it, send the coupon for your copy of "The Kodak Contour Projector."

the KODAK CONTOUR PROJECTOR

44

EASTMAN KODAK COMPANY
Special Products Sales Division, Rochester 4, N. Y.

Please send me a copy of your booklet, "The Kodak Contour Projector."

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____
(Zone)

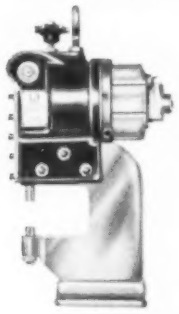
Kodak

GENTLE

and **POWERFUL** too

. . . that is why an Air Press does these jobs so well . . .

- **RIVETING**
- **PRESSING**
- **STAMPING**
- **CRIMPING**
- **PUNCHING**
- **MARKING**
- **DIE CUTTING**
- **EMBOSSING**
- **PIERCING**
- **SWAGING**
- **DIMPLING**
- **FORMING**
- **STAKING**

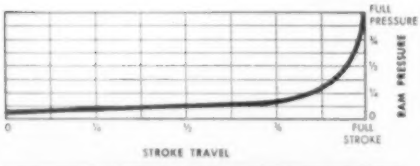


The Keller Compression Riveter is an efficient Air Press with 1⅝" stroke and up to 10 tons compression force. It does scores of jobs better and cheaper than other equipment because it has these advantages:

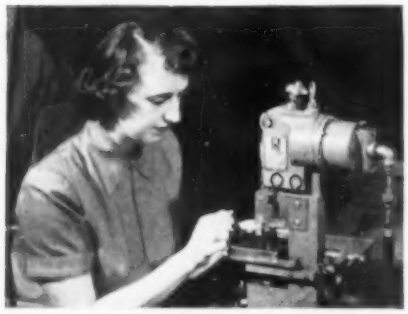
CONTROLLED POWER
READY ADAPTABILITY
LESS BENCH SPACE
LOWER INITIAL COST
LITTLE MAINTENANCE

It is available in two basic sizes for bench or pedestal mounting. Operates with a 3-way foot valve, or (optional) a throttle handle. So powerful it heads ¼" steel rivets . . . but so gentle it can assemble fragile plastic parts without breakage. Ask for Catalog Section 50.

HERE IS CONTROLLED POWER

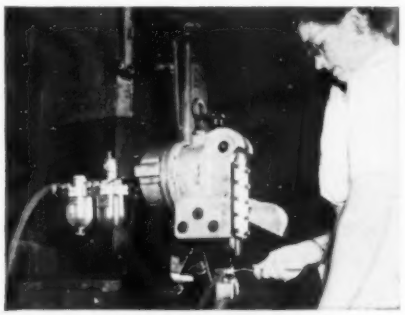


The Keller Compression Riveter delivers a squeeze—*not* a wallop! The chart at left shows how pressure builds up gradually along the length of the stroke, attaining maximum only at the very end. This gradual build-up of pressure avoids delivering a sharp impact which might distort small parts, or shatter fragile ones.



Assembling fragile plastic parts

Staking pins in electron tubes

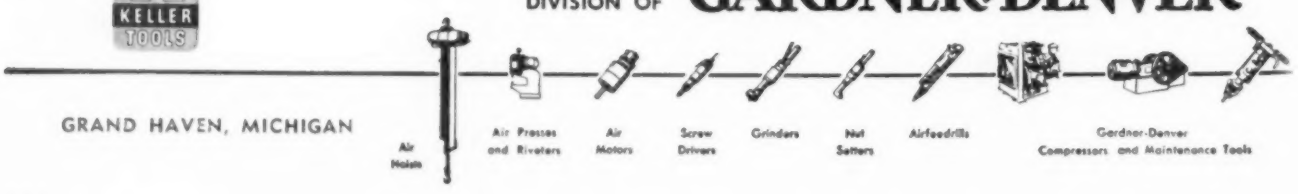


Swaging small metal parts

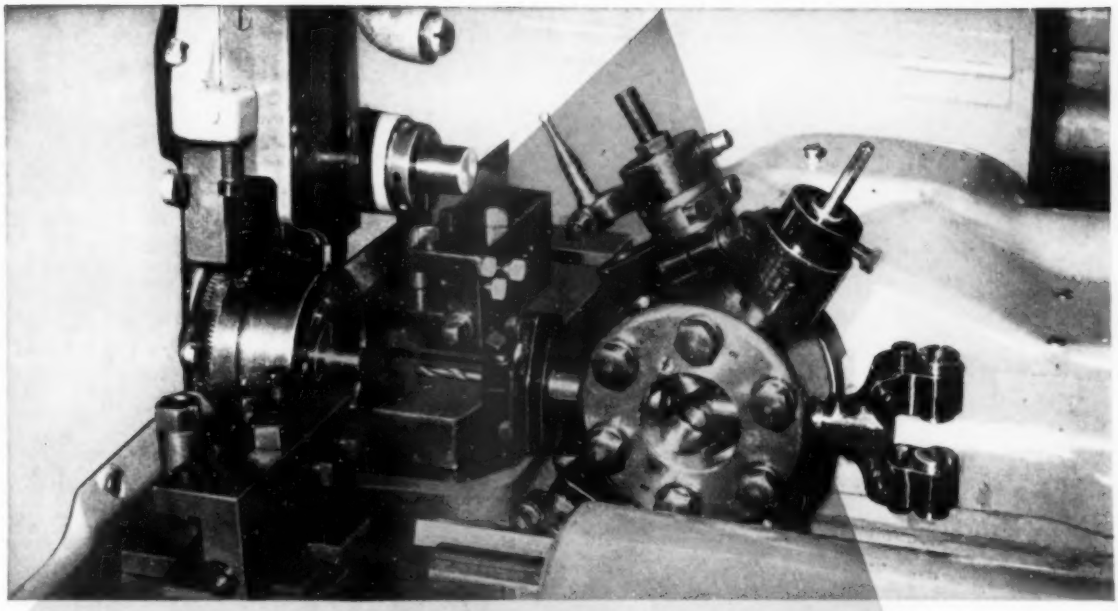
KELLER TOOL

DIVISION OF **GARDNER-DENVER**

GRAND HAVEN, MICHIGAN

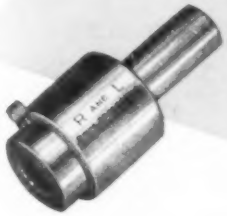


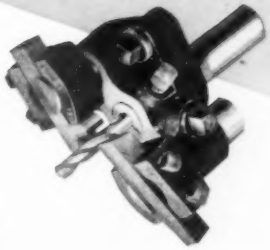
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-220



A MACHINE IS ONLY AS GOOD AS THE TOOLS USED ON IT!

FOR PRECISION AND ECONOMY — R and L TOOLS ARE UNBEATABLE





That is why leading manufacturers* supply R and L TOOLS as original equipment with their machines. We know of no finer testimonial, with the possible exception of the fact that last year 86.7 of all R and L TOOL orders were *repeat orders* . . . Satisfied customers who wanted more of the precision, time-saving and money-making qualities built into every R and L TOOL.

*List of manufacturers supplied on request.

Write for new catalog

CLIP AND MAIL THIS COUPON

R and L TOOLS
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

NAME.....

COMPANY.....

ADDRESS.....

TE-11

R and L TOOLS
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

You are missing a bet!

Use U.S. DRILL HEADS with Turret Lathes...

Write Today for Latest Catalog

Multiple Spindle Drill Heads have many uses, yet oftentimes they are not considered as being applicable to automatic turret lathes.

If you want to reduce labor costs and the number of operations required to complete a particular part, why not see how U. S. Drill Head engineers can help you.

Write or wire us today. There's no obligation, of course, and the chances are that we can save you time and money.

Manufacturers of all types of fixed center and individual lead screw tapping heads.

US HEADS

Since 1915

UNITED STATES DRILL HEAD CO.

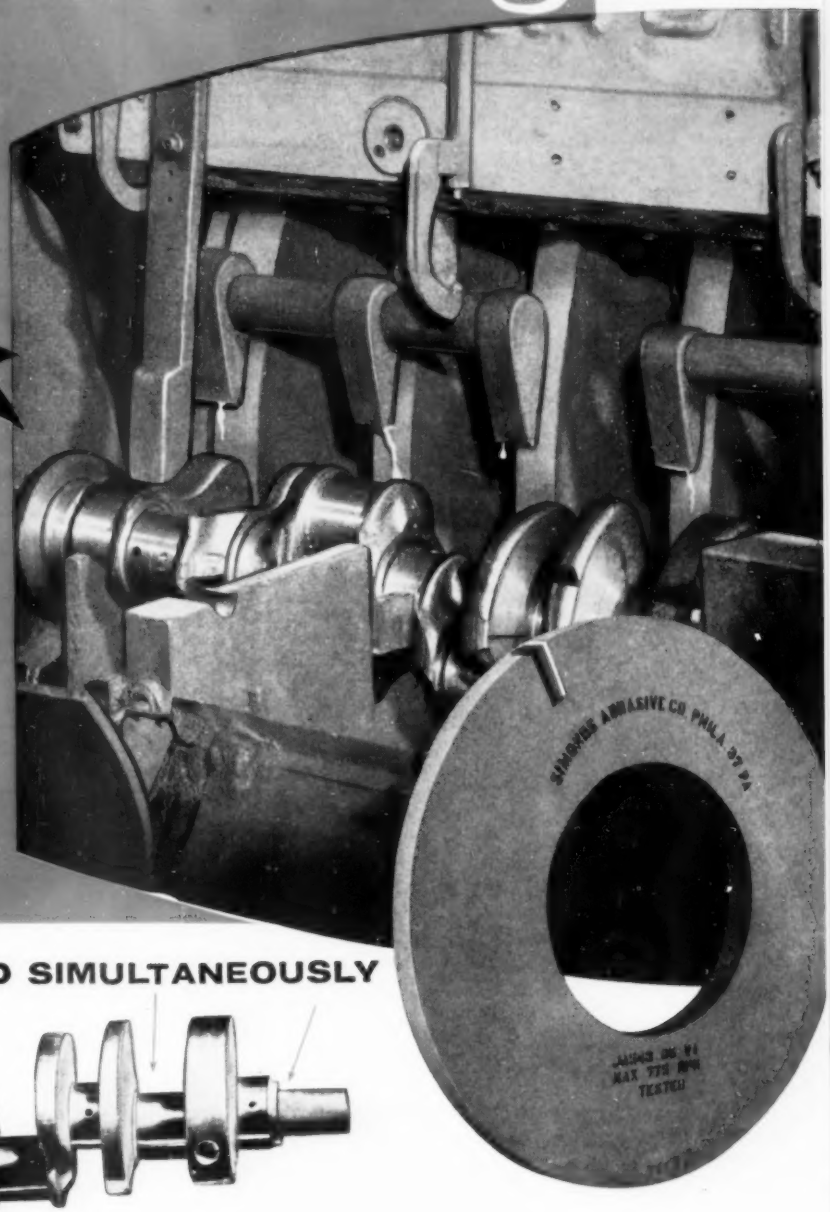
616-618 Burns Street, Cincinnati 4, Ohio

For Multiple Grinding

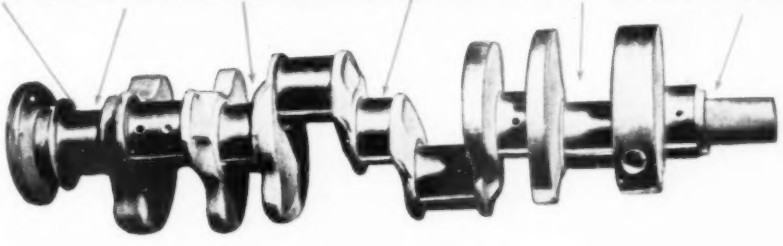
specify

SIMONDS ABRASIVE CO.

grinding wheels in MATCHED SETS



SIX DIAMETERS GROUND SIMULTANEOUSLY



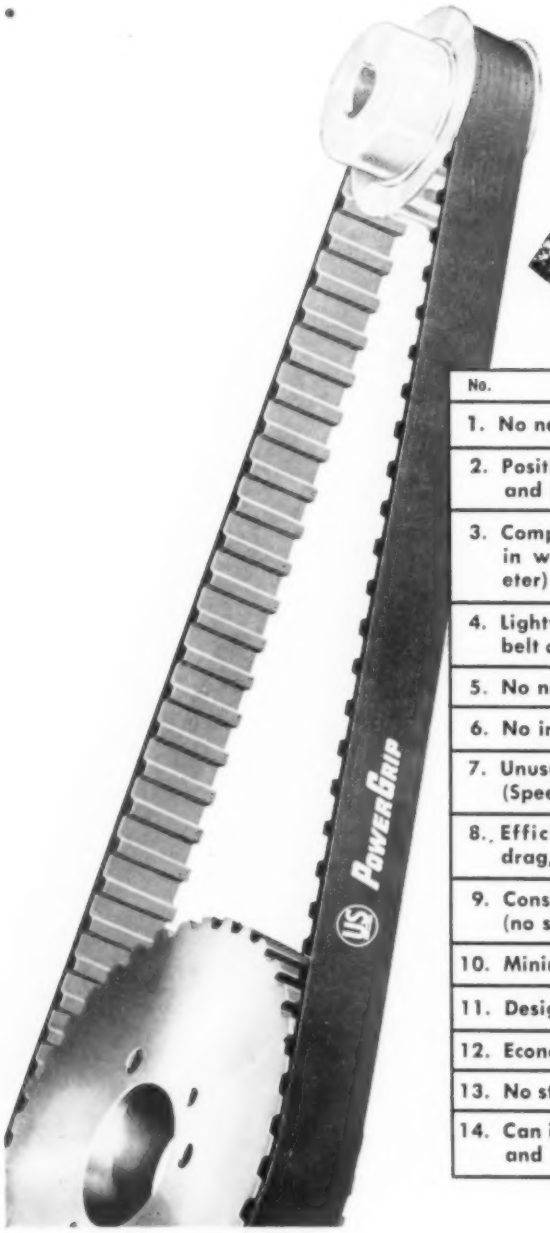
The crankshaft grinding operation illustrated here is typical of the production economies possible with "matched sets" of Simonds Grinding Wheels in multiple set-ups.

These wheels are furnished in counterbalanced sets, each wheel identified by set number, and painted on the face with a red stripe for accurate line-up on the spindle. Matched for best balance, these sets give more uniform grinding action, better and more production.

If you grind cylindrical parts requiring more than one diameter, investigate multiple wheel set-ups. A Simonds Abrasive Engineer will be glad to help you in determining the specification and recommended procedures for your job. Write for this service today.

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco | Distributors in Principal Cities
Division of Simonds Saw and Steel Co., Fitchburg, Mass. • Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Heller Tool Company, Newcomerstown, O., Simonds Canada Saw Co., Ltd., Montreal, Quebec, Lion Grinding Wheels Div., Brockville, Ont. and Simonds Canada Abrasive Co., Ltd., Arvida, Quebec



"√" in your transmission belt needs

No. Advantages	PowerGrip "Timing" Belt	Chain	Gear	V-Belts	Flat Belts
1. No need for lubrication	√				
2. Positive elimination of slip and creep	√				
3. Completely compact (Both in width and pulley diameter)	√				
4. Lightweight (Heavy duty belt only 0.1 lb./ft./in.)	√				
5. No noise or vibration	√				
6. No initial tension	√				
7. Unusual speed range (Speeds up to 12,000 FPM)	√				
8. Efficient (Elim. heat, lube drag, high bearing loads)	√				
9. Constant angular velocity (no speed fluctuation)	√				
10. Minimum backlash	√				
11. Design flexibility	√				
12. Economical	√				
13. No stretch	√				
14. Can it be completely housed and forgotten?	√				

Note that the U. S. PowerGrip "Timing" Belt takes a "√" after every advantage

While every type of drive has certain advantages, *no* type of power transmission possesses *so many* advantages as the U.S. PowerGrip "Timing" Belt drive. For example, *it is the only positive drive that never needs lubrication.*

THE LIST OF USES GROWS DAY BY DAY! Power production machinery in every field is made more efficient, volume of production increased, and maintenance costs lowered with this amazing belt. The list of OEM applications grows too numerous to mention. U.S. PowerGrip has streamlined hundreds of products . . . made them sell above competition. Some equipment would not be in existence at all, if it weren't for this great belt.

Immediate delivery of stock drives with ratios up to 12 to 1 is obtainable from any of United States Rubber Company's selected distributors or any of the 27 "U.S." District Sales Offices, or the address below.

Send for free illustrated manual, complete with standard drive tables.

See the U. S. PowerGrip "Timing" Belt in Booth 102 at the Production Engineering Show.

US RUBBER

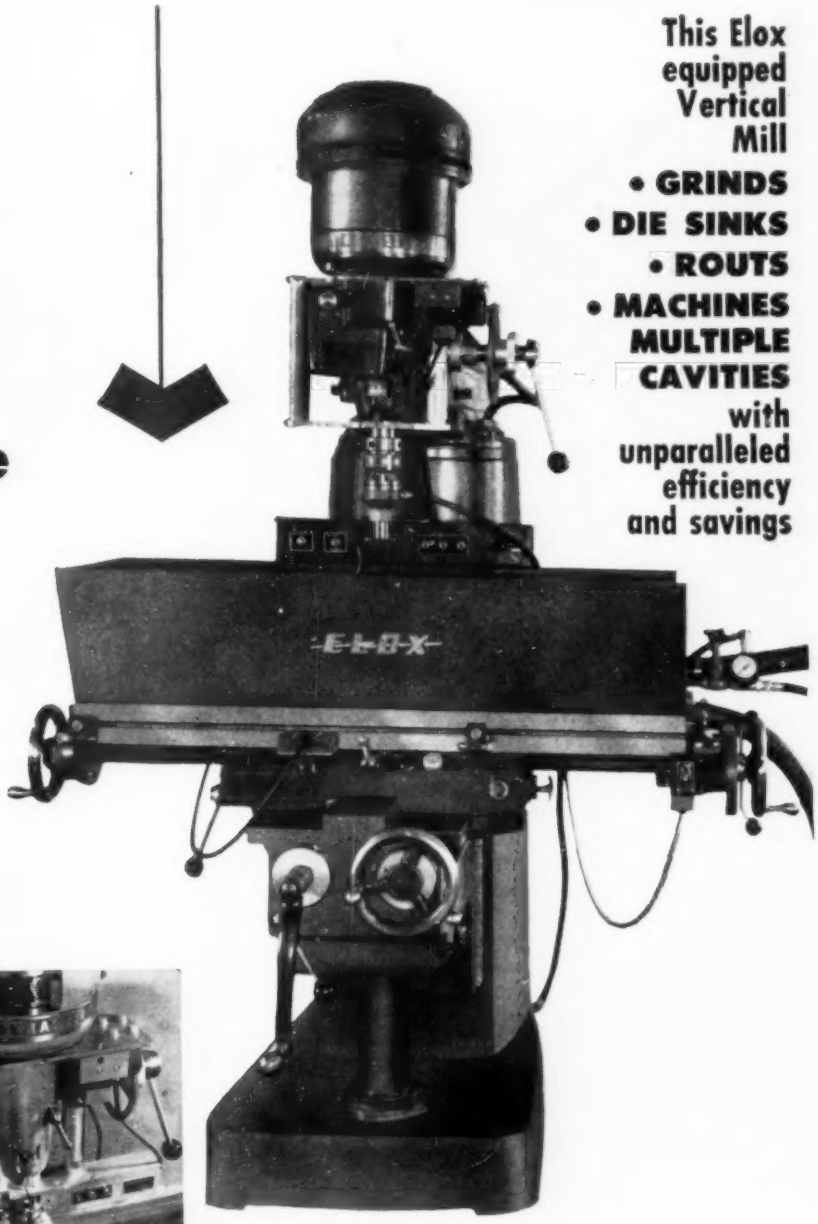
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

Electrical Discharge Machining produced this multiple cavity In 8 hours

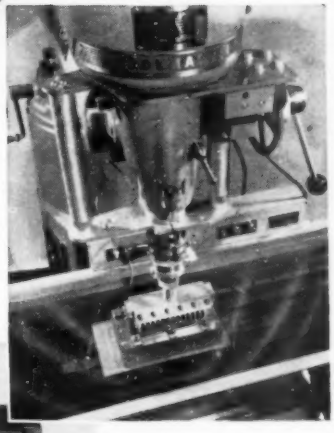
conventional machining time 40 hours



This Elox equipped Vertical Mill

- **GRINDS**
- **DIE SINKS**
- **ROUTS**
- **MACHINES MULTIPLE CAVITIES**

with unparalleled efficiency and savings



Multiple Cavity in coolant retainer tank of Vertical Mill. Machined automatically without operator attention or broach cost.

Finished die and brass electrode. Die Material: Hi Chrome Die Steel. Tolerances: +.0005″—.000 Finish: 15-20 micro inch.

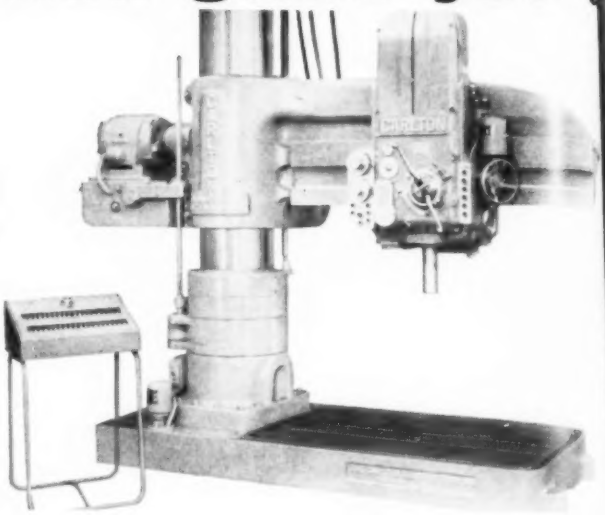
Our engineering staff is always ready to help solve your specific machining problems. Representatives in your area will arrange appointments, at your request, for grinding, die sinking and cavity forming operations at EDM Demonstration Centers.

elox corporation of michigan

737 N. ROCHESTER RD. • CLAWSON, MICH.

DEMONSTRATION CENTERS:
Plant—Clawson, Mich.
45 Broad Ave., Palisades Park, N.J.
1907 W. Monterey, Chicago, Ill.

only Carlton gives you



1. Programming and pre-selector gear shift sets up correct speeds and feeds for a complex sequence of operations.

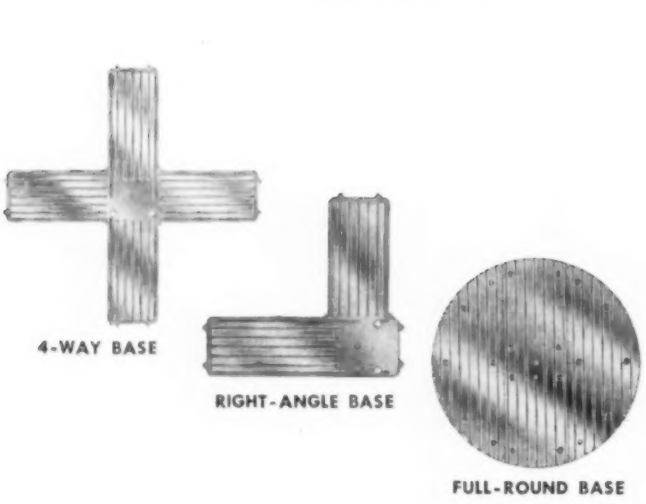
With the introduction of the new Carlton-Leber speed-feed programming and pre-selector systems, you can now take your choice of three speed-feed controls: programming, pre-selector or manual.

Programming works like this: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint and is transferred to the programming console.

The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector: For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit.

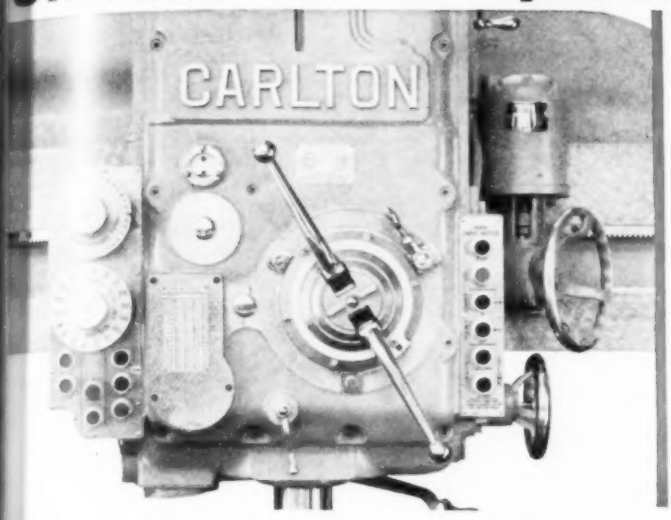
and special bases, tables and



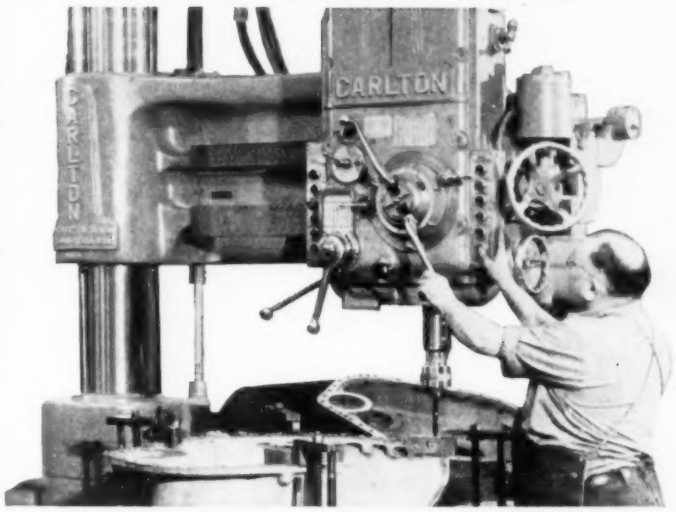
Special bases: Carlton radial drills can be furnished with any of seven different types of stationary bases (three of which are shown above). In addition, special track type mounting and sliding bed plate base also available.

Special tables: Plain, uni-tilt and full universal tables available as extra equipment. The universal table shown above is Carlton engineered and built, is fully universal and has a 32″ round top.

choice of 3 speed-feed controls



2. Pre-select gear shift: 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.



3. Manual gear shift: 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.

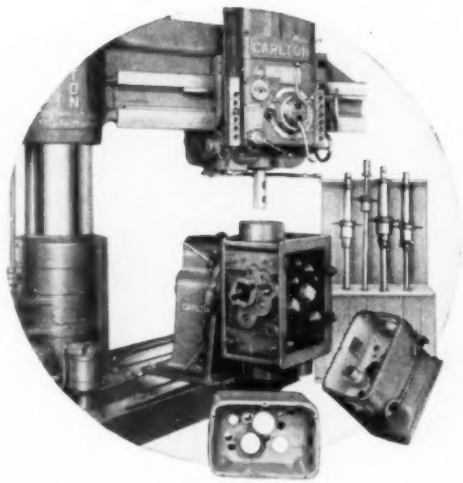
Manual gear shift: Selects speed-feed combinations in the conventional manner—manually, one at a time, using two speed shifter levers and two feed shifter levers.

Carlton gives you a wide choice in radial drill selection . . . not only in speed-feed control systems, but also in size and capacity. You're sure to find your most economical drill size at Carlton, because the broad Carlton line includes arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. For the complete range of sizes, send for descriptive literature.

Carlton also gives you the advantage of a wide selection of special bases, tables and jigs and fixtures (see below). A capable sales-engineering staff will study your requirements and submit without obligation a recommended tooling set-up that's best for you.

Carlton has just published a new 24-page booklet presenting the most modern concept on how you can get better, more efficient, lower cost drilling. Why not write for your free copy today? The Carlton Machine Tool Co., Cincinnati 25, Ohio.

jigs for additional productivity

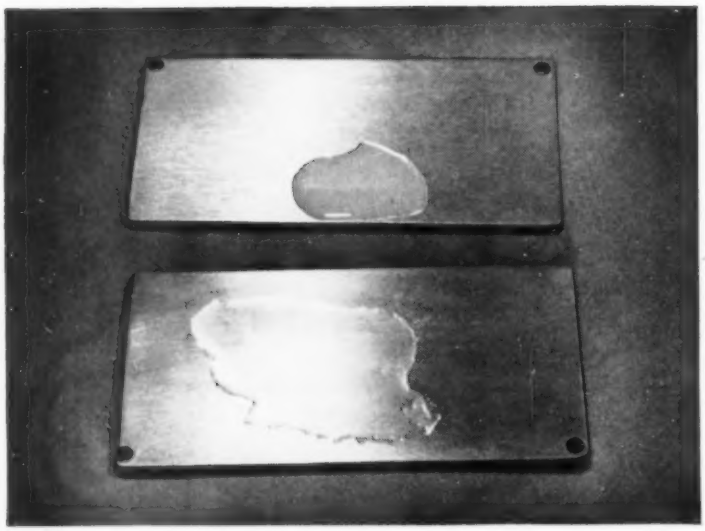


Special jigs: Carlton engineers will be glad to recommend the most efficient tooling for your requirements. The set-up shown above reduced running and set-up time from 7 hours down to 5.25 hours. Includes master trunnion, jigs and boring bars.

Carlton

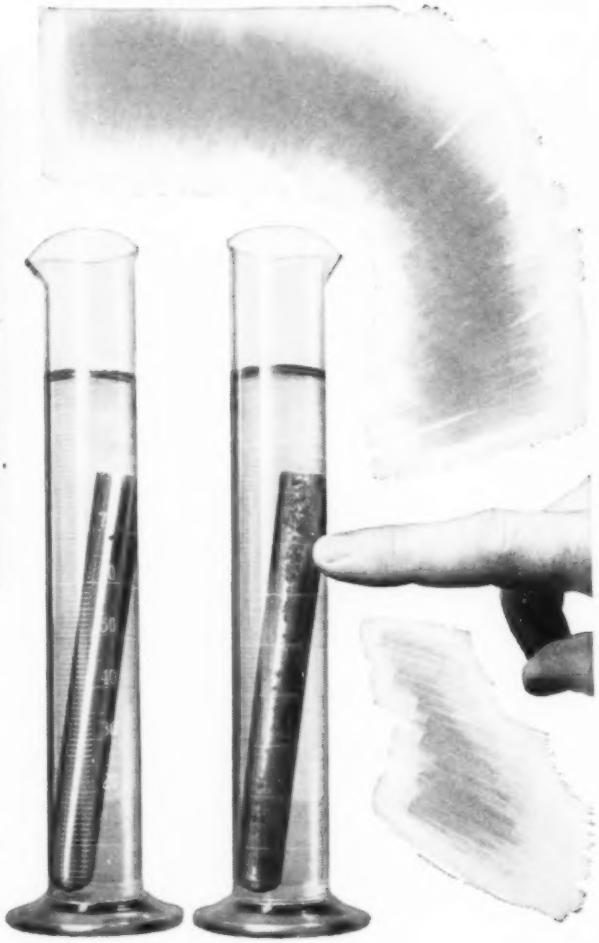
horizontal and radial drills

Announcing
SHELL
DROMUS OIL E



Above: Cooling action of a cutting fluid is directly related to its wetting ability. Conventional soluble oil emulsion (background) "balls" up. Equal amount of Shell Dromus Oil E spreads out thinly . . . wets far greater area.

Right: Plain carbon steel, if left in water at room temperature for about two hours, will rust as shown. Sample on left was in a 1-30 solution of Shell Dromus Oil E and water *for six months without rusting.*



SHELL DROMUS OIL E

NEW CUTTING OIL

permits higher speeds and faster feeds than ever maintained before

Shell Dromus Oil E, a new solution-type fluid, wets all metal surfaces with extreme rapidity and keeps both work and tools exceptionally cool. These qualities permit an increase of machine speeds and/or feeds far beyond anything allowable with conventional soluble oils.

IT'S MUCH EASIER ON TOOLS

There's much more life in any cutter or abrasive wheel when protected by this new oil. *It stays put* between tool and work. (At a 1-30 dilution, average tool life increase in extended field tests was about 50%.)

IT FIGHTS RUST

Shell Dromus Oil E is readily soluble in hot, cold, soft or hard water, and stable in any concentration. Even at low concentrations, it gives excellent rust protection to all ferrous metals, *including*

IT KEEPS WORK COOL

Even at stepped-up production rates, you'll find less heating and better finish wherever this new oil is used.

IT SETTLES OUT FAST

Chips and wheel particles settle out immediately . . . the recirculated fluid is clean and free from contaminating particles. It is *not* sticky or greasy . . . leaves no deposits on machines or work.

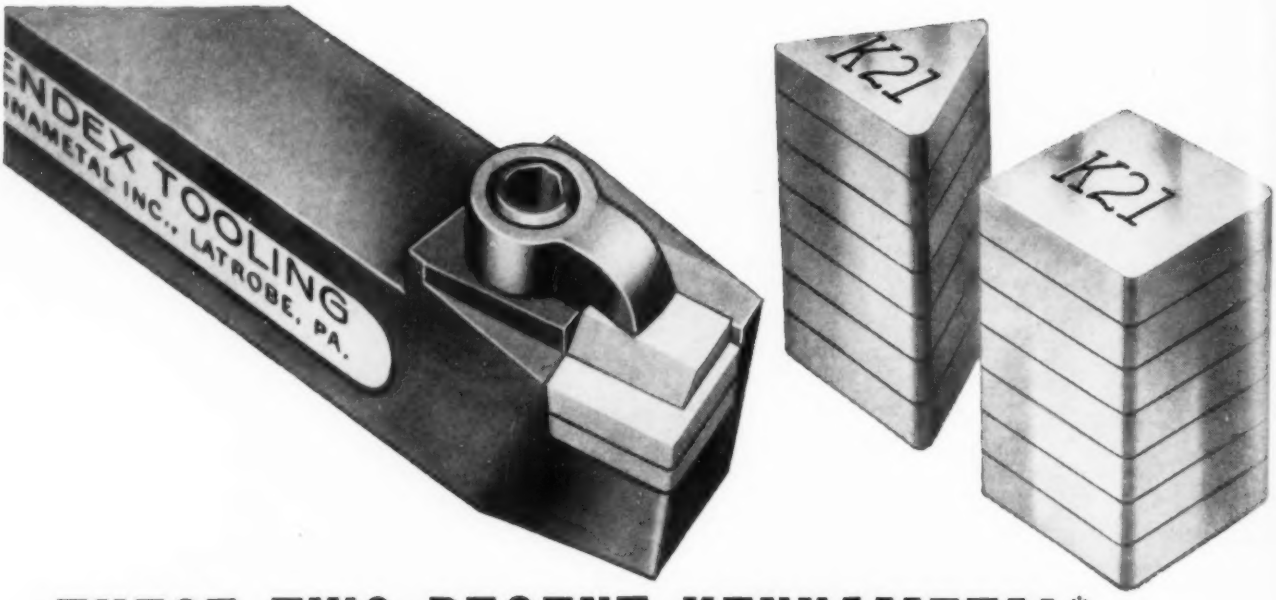
IT'S GREAT FOR GRINDING

Grinding wheels remain clean, *even when material retains a film of cutting oil from a previous operation.* Even cast iron can be ground cleanly when Shell Dromus Oil E is used to cool the work.

If all this reads "too good to be true," we suggest that you try Shell Dromus Oil E *on any problem operation you have.* It *is* that good!

SHELL OIL COMPANY

50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California



THESE TWO RECENT KENNAMETAL* DEVELOPMENTS HELP TO MEET TODAY'S HIGH-SPEED PRODUCTION NEEDS

The profit advantages of today's high-speed automatic cycling machines for metal cutting are lost when tools wear rapidly—need frequent regrinding—or are cumbersome to index.

Kennametal recently introduced two new developments to help give you continuous machine performance, and to help step up profits in your steel-cutting operations. These developments are Kendex*† Button Tooling and Kennametal Grade K21.

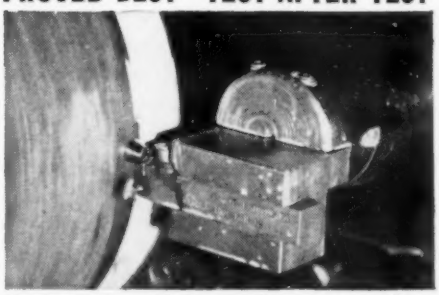
Kendex "turnover" inserts, with replaceable Kennametal shims and new chip control system, double the number of cutting edges, eliminate all regrinding and index in seconds. These features help provide consistent tool performance and hold downtime to a minimum.

Grade K21 is the General Purpose steel-cutting carbide now outperforming all other medium grades in the carbide industry. Superior performance of K21 is due to exceptionally high edge strength, strong resistance to cratering and superior wear qualities. An extremely versatile grade, K21 can be applied to general steel-cutting, heavy roughing and finishing.

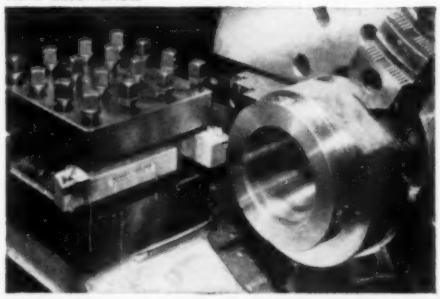
Kendex, in 17 styles and sizes; and K21, in popular blanks and inserts, are immediately available from stock. For their right application on your machining jobs, call a Kennametal Tool Engineer. He works exclusively with Kennametal . . . applying and servicing it. And be sure to ask for reports of Kendex and K21 repeat performances, job after job. KENNAMETAL INC., Latrobe, Pa.

*Registered Trademark †Patent applied for 9403

PROVED BEST—TEST AFTER TEST

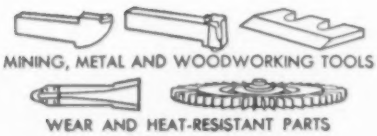


Kendex Tooling with "turnover" inserts cuts tool cost from $1.20 to $0.09 per piece, turning SAE 4140 tank assemblies.

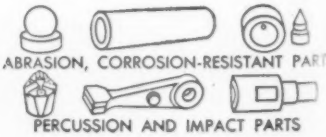


Grade K21—on interrupted cutting, roughed and finished 6 times as many pieces as other premium carbide.

Give your machines the tools they deserve . . . the BEST



INDUSTRY AND **KENNAMETAL** *. . . Partners in Progress*



New Improved

REED Thread Rolling Attachment

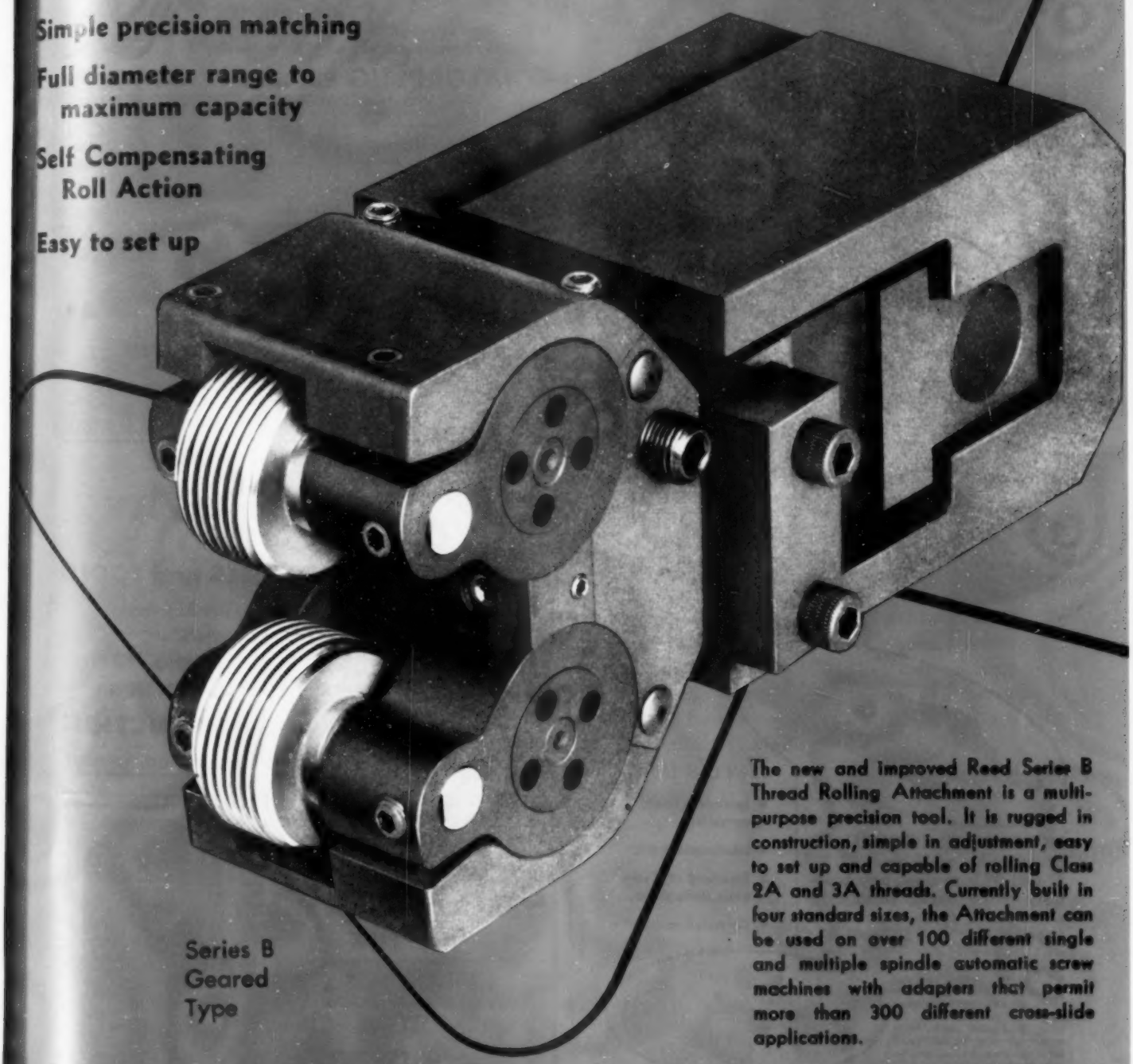
For Automatic Screw Machines

Simple precision matching

Full diameter range to maximum capacity

Self Compensating Roll Action

Easy to set up



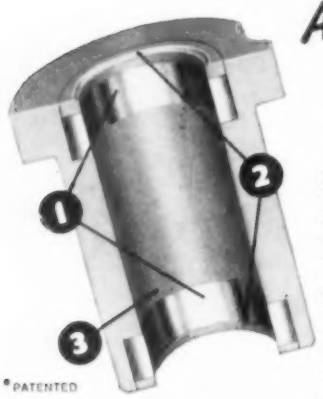
Series B
Geared
Type

The new and improved Reed Series B Thread Rolling Attachment is a multi-purpose precision tool. It is rugged in construction, simple in adjustment, easy to set up and capable of rolling Class 2A and 3A threads. Currently built in four standard sizes, the Attachment can be used on over 100 different single and multiple spindle automatic screw machines with adapters that permit more than 300 different cross-slide applications.

Write for Attachment Bulletin B-1

REED ROLLED THREAD DIE CO., Worcester, Mass., U. S. A.

MORE HOLES— MORE ACCURACY— FASTER— AT LESS COST



MEYCO
Carbide Inserted Bushings Are Doing It Daily!

HOW? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that come close to the prices of ordinary steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

*PATENTED

1. Tungsten carbide rings at the points of wear, 2. Steel rings protect drills and carbide, 3. Special hardened alloy steel body.

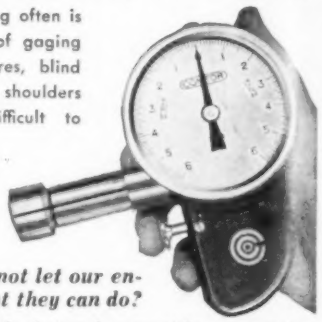
For information and prices write for Meyco Bushing Catalog No. 42

W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-11-232-1

SPECIAL Internal Gaging Problems are often easily solved by this gage

With slight modifications Comtorplug often is the simplest solution to problems of gaging splines, deep holes, spherical bores, blind holes, shallow holes, counterbores, shoulders and other bores considered difficult to gage.



If you have a "toughie", why not let our engineering department see what they can do?

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

UNIQUE ADVANTAGES
Positive gaging accuracy to fraction of .0001" regardless of who operates it.
Indicates actual size, a fixed—not passing—reading.
Positive 2-point gaging—automatic centering.
Shallow holes, deep holes, inside splines, open-end holes gaged easily.
Detects ovality, back or front taper, bell mouth, barrel shape.
Reaches to bottom of blind holes. Gages work while still held in chuck.
A shop tool for all-day every day use.
Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance, and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

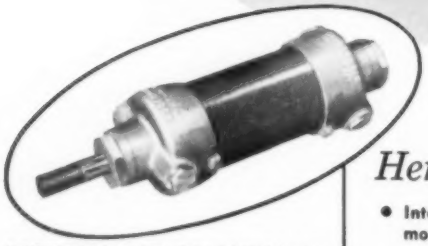
COMTOR CO.
69 Farwell Street
Waltham 54, Mass.

GET THE FACTS — REQUEST BULLETIN 48
USE READER SERVICE CARD; INDICATE A-11-232-3

Simplest to Install and Service!

Modernair Trademark

PROVENAIR Air and Hydraulic CYLINDERS

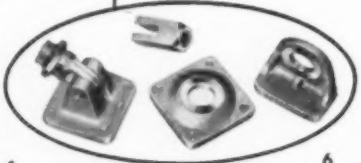


Here's why:

- Interchangeable mountings
- Heads rotate 360°
- Standard "O" ring seals throughout
- Corrosion resistant

MODERNAIR PROVENAIR cylinders are available in 2", 3", 4" and 6" bore sizes, any practical stroke length, cushion or non-cushion types. Operate to 400 p.s.i. in 2" and 3" bores, 200 p.s.i. in 4" and 6".

Why gamble when you can get PROVENAIR—the pioneer corrosion-resistant cylinder backed by more than 10 years successful use? Write today for new MODERNAIR catalog — most complete in industry!



6

Modernair CORPORATION
TRADEMARK
Dept. H-11 400 PREDA ST. • SAN LEANDRO, CALIF.
Member of National Fluid Power Association
USE READER SERVICE CARD; INDICATE A-11-232-2

Fellows

MACHINES and TOOLS
FOR CUTTING
. . . SHAVING
. . . BURNISHING
AND INSPECTION
In **GEAR PRODUCTION**

FELLOWS

THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-11-232-4

KEYLESS DRILL CHUCKS

SLIP-PROOF
STRONGEST CHUCK MADE
TRY ONE

K. O. LEE CO.
ABERDEEN, S. D.

If it's made by **Lee** *it's a* **"Knock-Out"**

USE READER SERVICE CARD; INDICATE A-11-232-5

Forging: COPPER • BRONZE • ALUMINUM • MONEL AND STAINLESS STEEL

Heating for forging 1" stainless hex-head machine bolt blanks with 10,000 cycle TOCCO Induction Heating Unit. Photo — courtesy The H. M. Harper Co.

with TOCCO* Induction Heating

● Naval Bronze, Silicon Bronze, Copper, Aluminum, Monel and all types of stainless steel are heated for forging at the H. M. Harper Co., Morton Grove, Illinois. Regardless of material TOCCO can be profitably applied to brazing, heat-treating and forging operations in almost any metal-working plant.

PRODUCTION UP—In addition to the very important savings in forging dies, TOCCO has increased production to as much as 265% of output possible with former heating methods. On the 1" type 303 Stainless machine bolt blanks shown here TOCCO upped production from 75 to 200 parts per hour, using 35 K.W., 10,000 cycles.

VERSATILE—The same TOCCO machine is used on stock of ⅜" to 1¼" diameter; heated zones vary from ½" to 4". TOCCO'S automatic timing cycles provide complete uniformity of heating throughout both length and cross section—assuring a uniformly high quality product.

●

Why not have a TOCCO Engineer investigate your plant to determine where TOCCO can cut your costs and streamline your production?

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

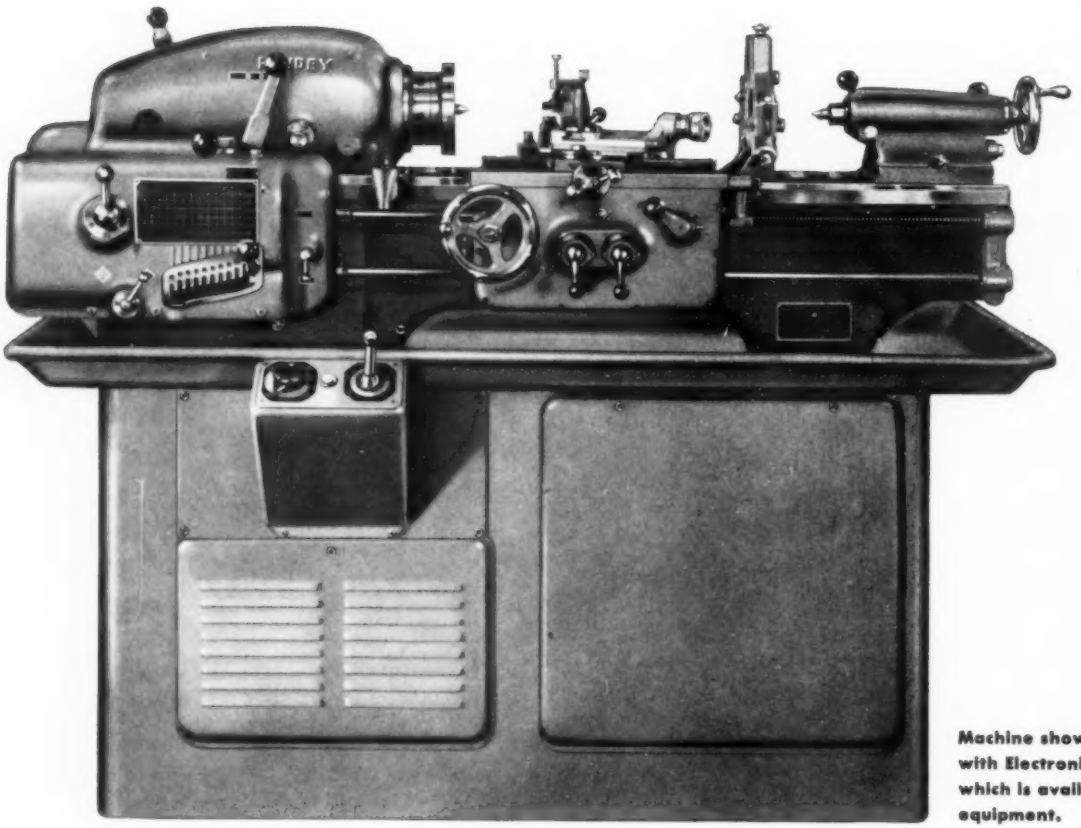
NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-11, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

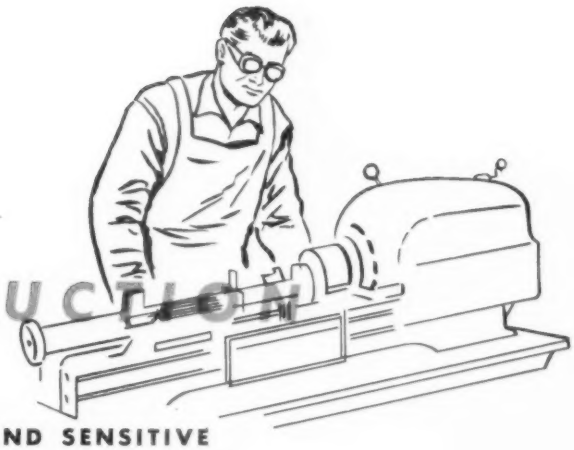
Name _____
Position _____
Company _____
Address _____
City _____ Zone ___ State ___

Hendey TOOL and GAGE MAKERS LATHE for PRECISION HIGH SP



Machine shown is equipped with Electronic Speed Cont which is available as extra equipment.

TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT MA



HIGH SPEED PRODUCTION

HEAVY DESIGN,
HIGHLY ADAPTABLE AND SENSITIVE
FOR PRECISION WORK AT HIGH SPEEDS.

The Hendey 9" x 24" Tool and Gage-Makers Lathe provides maximum precision and versatility for tool-room and production use. Some of the features of the standard machine include:

Infinitely variable spindle speeds to 3000 RPM
Convenient operation
Hardened and ground V ways
66 quick-change thread cutting and feed changes
Pre-loaded, super-precision, anti-friction spindle bearings
Precision lead screw
Feed shaft independent of lead screw
10¼" swing over ways — 24" Center distance

As extra equipment, this lathe can be furnished with an electronic speed selector for maximum sensitivity of spindle speeds and for full torque at low speeds. Speeds are infinitely variable and can be changed smoothly and easily while under load.

Whatever your toolroom and production problems may be, investigate the 9" x 24" Tool and Gage-Makers Lathe. Call your nearest Hendey representative, or write for bulletin.

MACHINE TOOLS *Hendey* machine division
BARBER-COLMAN COMPANY
211 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

MACKLIN WHEELS *for your every need*

MACKLIN has long had the reputation for producing the highest quality grinding wheels for all types of production and specialized grinding requirements. Macklin's contributions to the general improvement of grinding wheels in their twenty-eight year history have been many.

The latest, the patented and proved M M process bids well to be one of the greatest single improvements of all time. The unique construction of this new wheel with its self dressing qualities makes it a must on those difficult jobs that have been causing you trouble.

Regardless of what your grinding problem may be, or even though you may not feel that you have a problem, you owe it to yourself to fully investigate how Macklin can assist you in improving your grinding costs.

Call your Macklin distributor or factory man today.

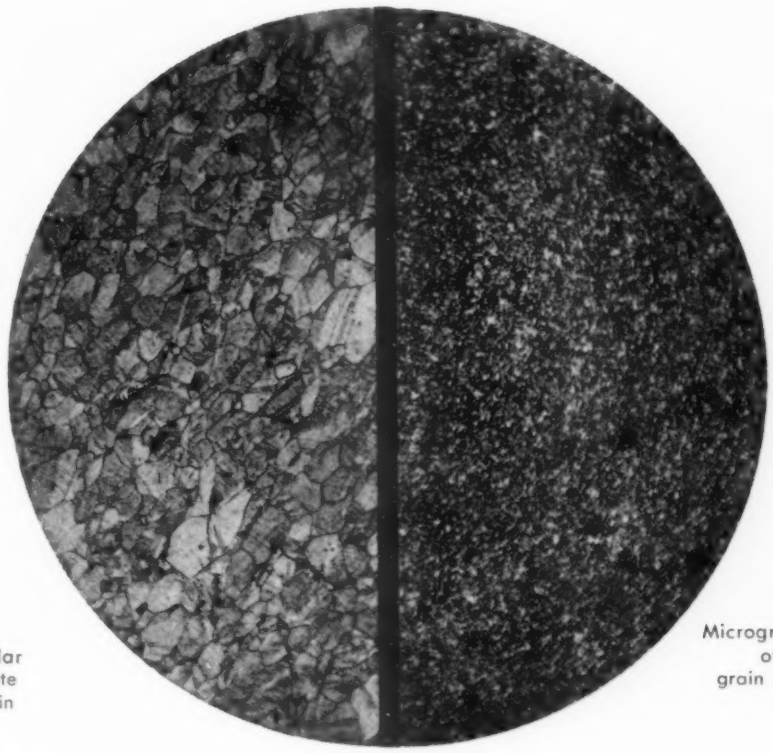
MACKLIN COMPANY

***Manufacturers* of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS**

JACKSON, MICHIGAN

Get longer life in formed parts AT NO EXTRA COST

USE THE NEW FINE GRAIN PHOSPHOR BRONZE WITH 30% GREATER ENDURANCE LIMIT



Micrograph (75x magnification) of regular phosphor bronze. Note relatively coarse grain structure.

Micrograph (75x magnification) of Duraflex. Its fine grain structure is the secret of its superiority.

DURAFLEX*

BY ANACONDA

DURAFLEX is a new, fine-grain phosphor bronze developed and sold only by Anaconda. Comparative fatigue tests show that the endurance limit of DURAFLEX is approximately 30% higher than for regular phosphor bronzes. In surface appearance, surface smoothness and hardness, it is superior to other phosphor bronzes. It is unsurpassed in corrosion resistance by any other phosphor bronze. Further, its formability is increased with no sacrifice in yield strength. DURAFLEX is a *premium* phosphor bronze in every way except cost; there's *no increase in price.*

If you're now using a hard-temper phosphor bronze, chances are that you can do the same forming in extra-hard temper DURAFLEX.

If you're looking for longer life in the parts you form, we'll be glad to send you a free sample of DURAFLEX. Try it, test it, and you will agree that it is superior.

*Trade Mark

SEE FOR YOURSELF—

AN

ANACONDA®

PRODUCT

MADE BY THE AMERICAN BRASS COMPANY

FREE SAMPLE

The American Brass Company, Waterbury 20, Conn.

(In Canada: Anaconda American Brass Ltd., New Toronto, Ontario)

Yes, we'd like to try DURAFLEX. Please send us a free sample of

sheet in_____ temper,_____ thick,

wire in_____ temper,_____ diameter.

☐ **We'd like to talk to one of your representatives about DURAFLEX.**

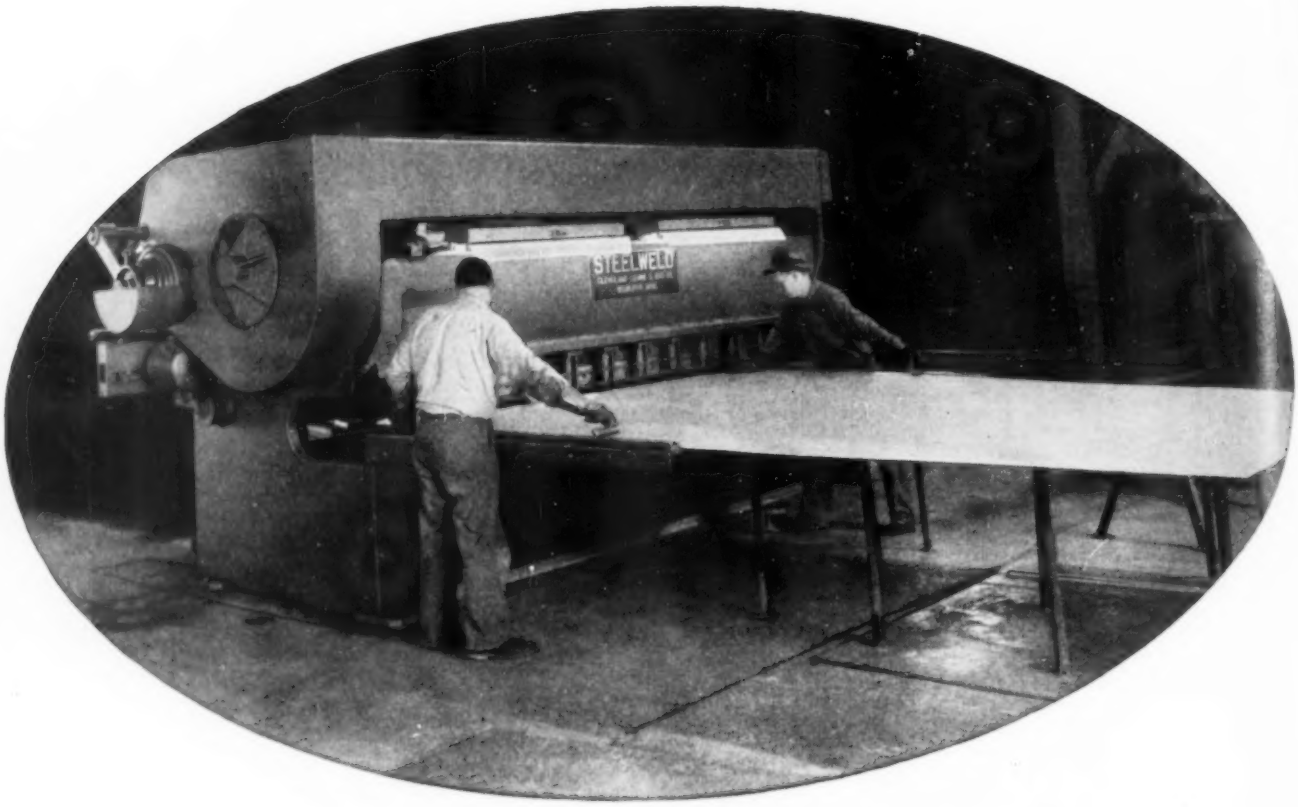
NAME . . . . . .

COMPANY . . . . . .

STREET . . . . . .

CITY . . . . . STATE . . . . . .

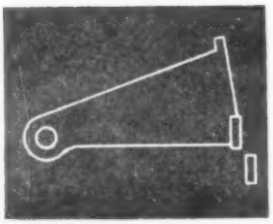
SHEET . . . up to 0.062" thick
WIRE . . . up to 3/16" diameter (approx.)



PIVOTED-BLADE MAKES SHEARING

Fast . . Easy . . Accurate

Because of the pivoted-blade design, Steelweld Shears have several outstanding advantages heretofore unavailable in any shears at any price, which make shearing fast, easy, accurate:



EASY KNIFE ADJUSTMENT

A direct result of this design is the easy knife adjustment it makes possible. Knife clearance is quickly made to suit every plate thickness by simply turning a crank until pointer in an indicator is set for the metal to be cut. No bolts to loosen; no parts to move.

ELECTRIC FOOT CONTROL

This feature eases the operator's work because the foot switch requires practically no effort to operate and can be slid around to wherever most convenient to use. It has been adopted as standard for all Steelweld Shears.

ALL-WELDED ONE-PIECE FRAME

Only because of the pivoted-blade design, was it possible to weld all parts of the frame into one solid integral unit. As there is no need of moving the bed to adjust for knife clearance, it, too, is welded permanently to the end housings. Since there are no bolted connections to loosen and misalign, deflections are minimized and long-time accuracy assured

MANY MORE IMPORTANT FEATURES

These are a few of the features. There are many more. When you get the facts you will agree that no other shears compare with Steelwelds.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
8513 East 282 Street, Wickliffe, Ohio

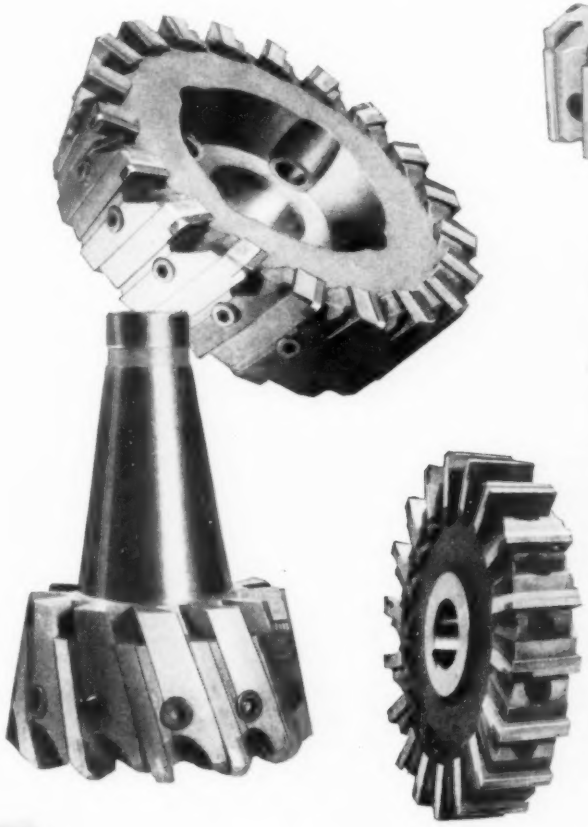
STEELWELD PIVOTED BLADE SHEARS

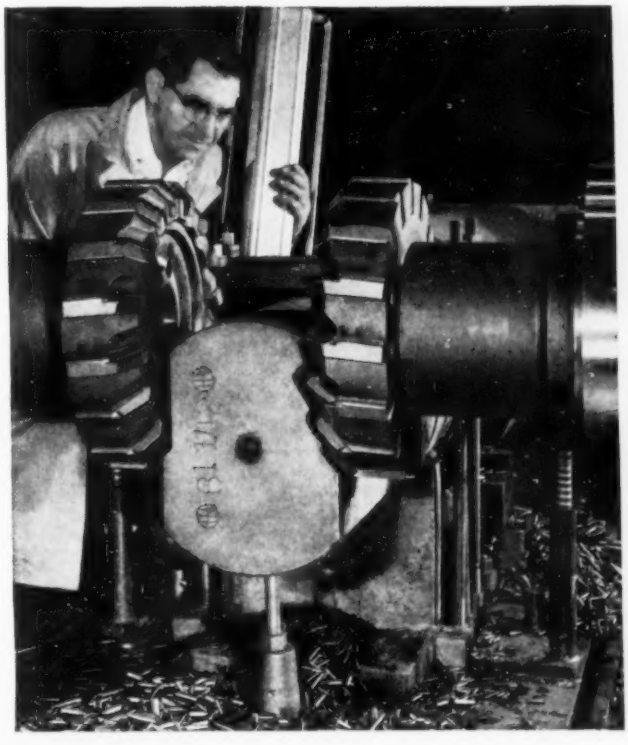
INGERSOLL
CARBIDE CUTTERS

Have you seen what they can do?

Difficult and unusual operations such as milling the ends of the rolling mill roll shown below help Ingersoll to design carbide cutters for large increases in production.

A leader in carbide research, Ingersoll has developed new cutting techniques using improved grades of carbide. Ingersoll inserted blade cutting tools, for all kinds of materials, will give you increased feed rates and longer blade life. Our cutter engineers are available to show you how Ingersoll carbide cutters can multiply production on your particular milling and boring machines.





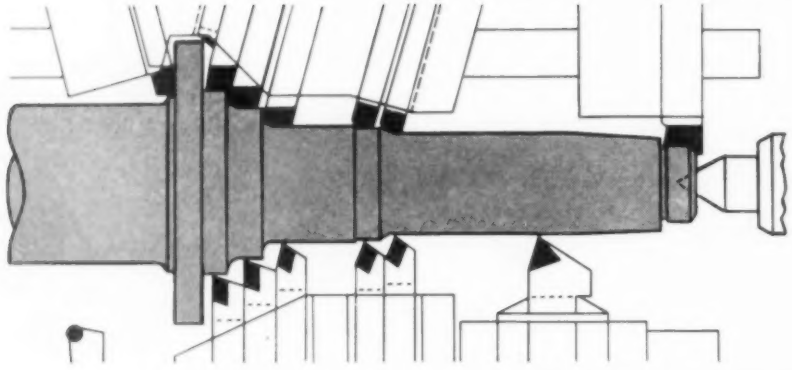
WRITE FOR CATALOG 66F

Write for Cutter Catalog 66F, describing Ingersoll inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters and boring heads.

THE INGERSOLL MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF SHEAR CLEAR CUTTERS

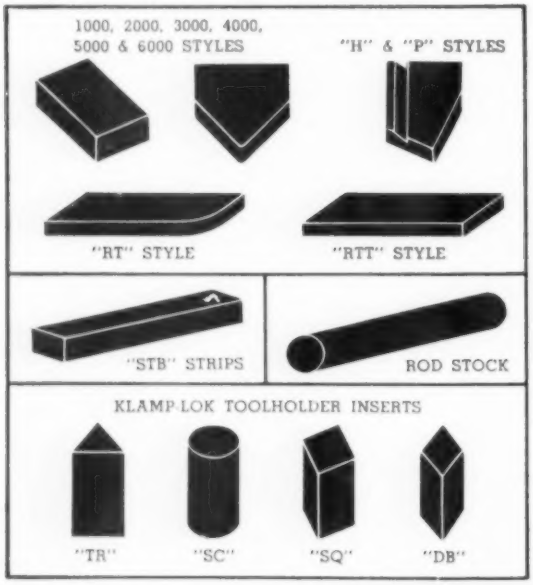
THE TURNING POINT TO HIGHER PROFITS!



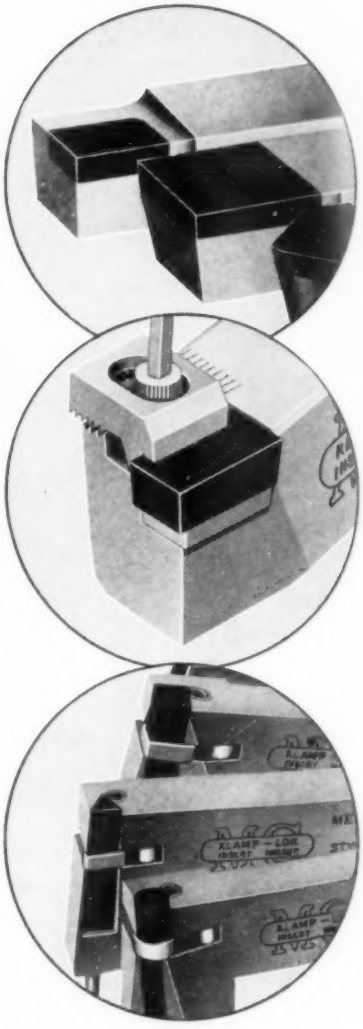
PRODUCTION RATE—UP 25%, TOOL COST—DOWN 40% AT LARGE MID-WEST TRACTOR PLANT

PART	Shaft Steering Clutch, SAE 8654-H Brinell 370.
OPERATION	Rough Straddle Face Flange, turn all diameters, form undercut and base.
MACHINE	16 x 60 Sunstrand Automatic Lathe.
TOOLS	8 Talide-tipped facing, chamfering, radius and form tools Grade S-88. 7 Klamp-Lok Toolholders with round, triangular and parallelogram Talide inserts Grade S-88.
DEPTH OF CUT	9/32" to 7/16"
FEED	.022
S.F.M.	156
RESULTS	Production up 25%—Scrap and rejects down.

A FULL LINE OF TALIDE TIPS IS AVAILABLE IN OVER 1000 SIZES, STYLES, SHAPES AND GRADES—TO MEET EVERY MACHINING REQUIREMENT



ALL-PURPOSE TALIDE TOOLS



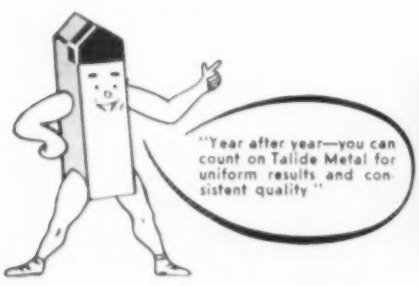
NEW IMPROVED CUTTING GRADES

An extensive 2-year research and development program has resulted in a completely new and improved series of Talide Metal grades for all-purpose machining. "Double-carbides" containing tantalum carbide and tungsten carbide have been perfected for cutting cast iron and non-ferrous alloys, and "triple-carbides" containing tantalum carbide, titanium carbide and tungsten carbide for machining steels.

Major improvements have been made in our rigidly controlled vacuum furnace technique. This, along with additional refinements in our process has resulted in the creation of a carbide having a new, unique grain structure possessing harder and tougher properties than previous grades.

Laboratory tests reveal that these new, improved grades have 25% greater strength and rigidity. Extensive field tests have proven that service life per grind is increased up to 50% over previous grades. **Metal Carbides Corporation, Youngstown 7, Ohio.**

Send for new 84-page Catalog No. 55-G.

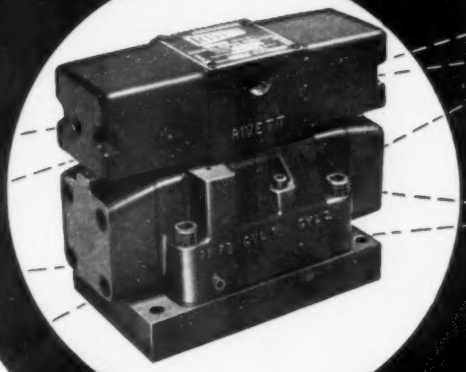


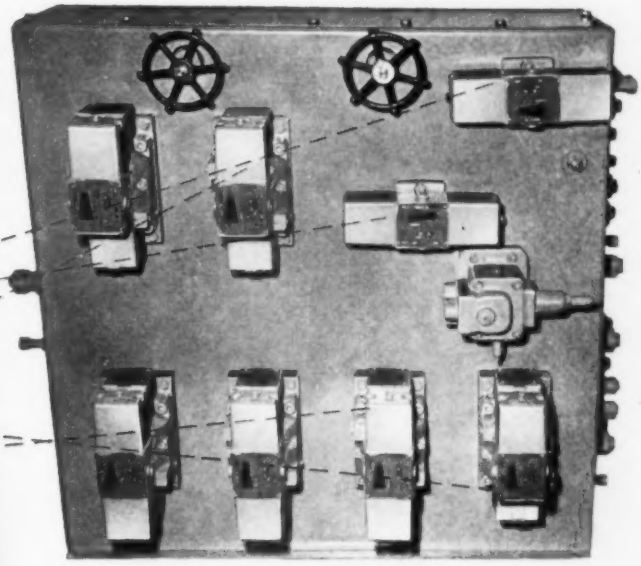
METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 7, OHIO

HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

13 cylinder circuit controlled automatically

with Rivett Panel Valves





Integrated control panel with Rivett single and double solenoid pilot-operated valves; and double solenoid pilot valves.

These features offer better automatic control

1. 3000 P.S.I. conservatively rated.
2. Meet all J.I.C. Standards.
3. Greater flow capacity (¾" rated at 28 G.P.M. at 15 ft. per sec.)
4. 7 spool designs. All interchangeable in same body.
5. Dust-sealed. Moisture-resistant cover.
6. Shock-resistant spool
7. Shock-mounted, continuous duty solenoids.

Intricate circuit of new plastic injection molding machine contains 2 injection cylinders, an ejector cylinder, gate cylinder, metering cylinder, 2 die cylinders, 2 post cylinders, 2 plate cylinders and 2 shot cylinders—hydraulically controlled by 7 Rivett Panel Mounted Solenoid Operated Valves.

The Michigan manufacturer of this unit selected Rivett Valves for their: 1—greater flow capacity; 2—low pressure drop; 3—compactness; 4—shock resistance and 5—reduced maintenance.

Increasing numbers are finding Rivett 6600 Series Valves the most practical for control of automatic operations. Working with Rivett engineers and sales representatives, these users are able to improve a machine's design, operation, life, and above all to lower its cost!

RIVETT LATHE & GRINDER, INC.
Dept. TE 11, Brighton 35, Boston, Massachusetts

Get Data-filled Valve Catalog. Shows flow for all piston designs; working drawings; specifications. Write for free copy today!

The Better You Know Hydraulics, The Better You Like

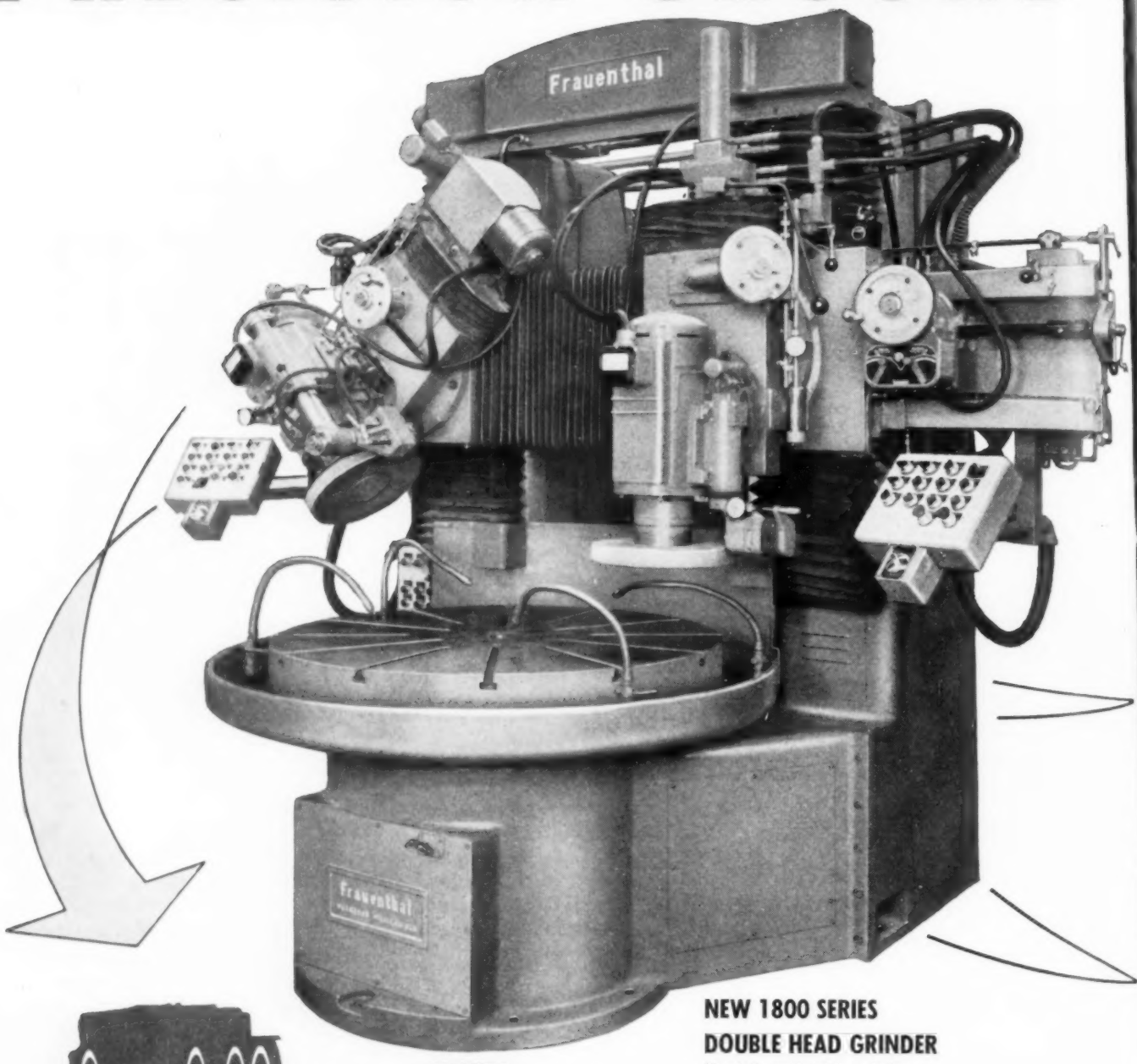
Representatives In All Principal Cities

RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

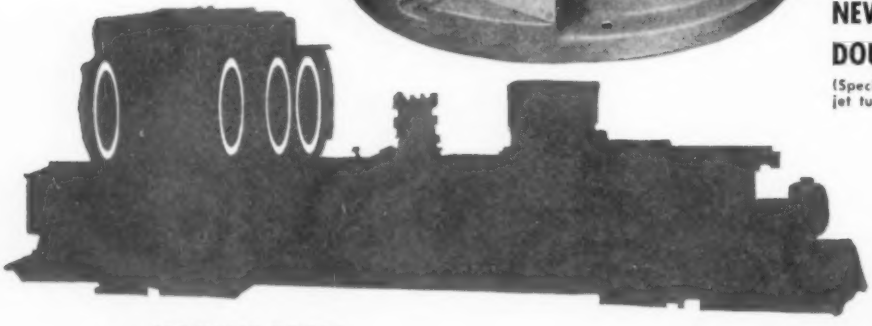
Member National Fluid Power Association

PRECISION-GROUND



NEW 1800 SERIES
DOUBLE HEAD GRINDER

(Specially equipped for grinding jet turbine blades)



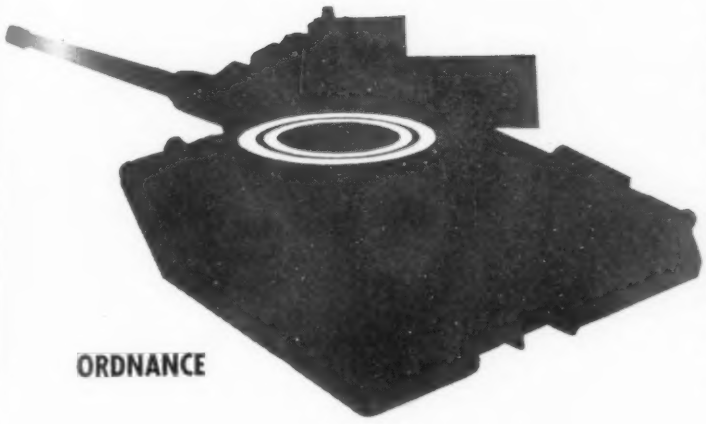
MACHINE TOOLS

Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.

Frauenthal Division

COMPONENTS . . .



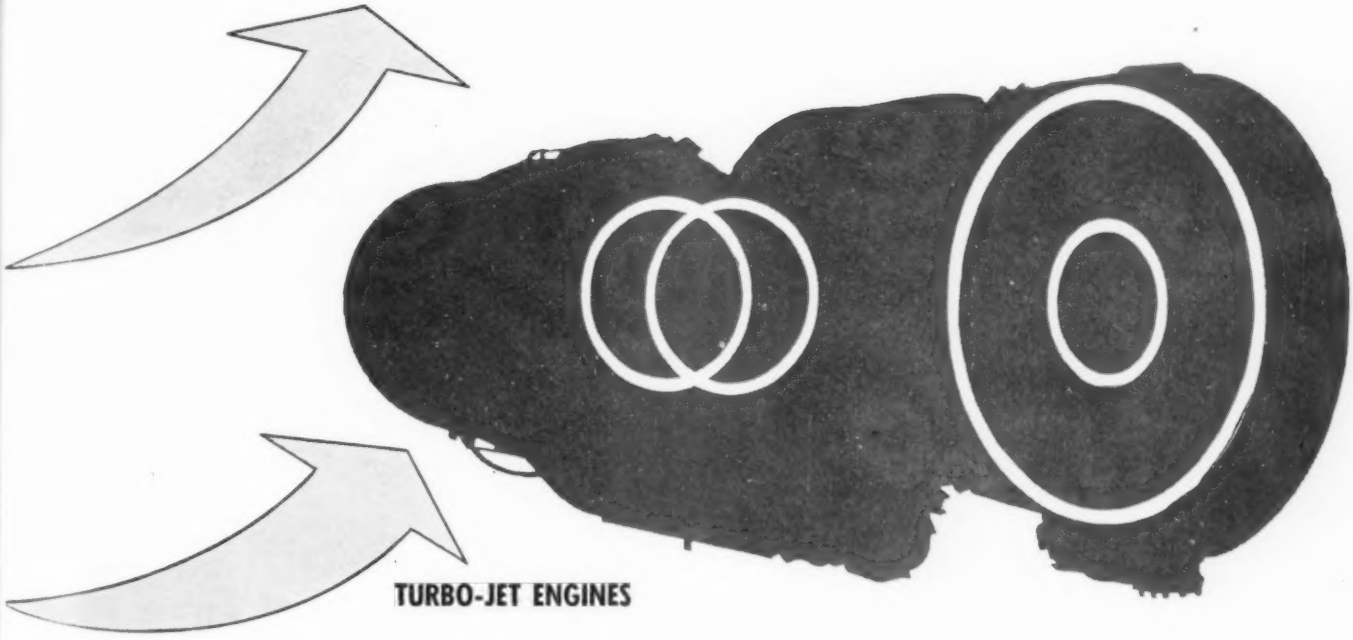
ORDNANCE

WHATEVER YOUR FIELD OF INDUSTRY —.With Frauenthal precision machines, you're able to grind diameters and related surfaces without changing setup of the workpiece and obtain accuracies within .000200". This assures consistently uniform precision in concentricity, parallelism and roundness.

The accuracy and versatility of Frauenthal equipment is unequalled in the machine tool field. Difficult work-pieces — those impossible to handle on conventional horizontal grinding equipment — are handled with comparative ease on these unusual machines.

Four different series of machines are available affording table sizes up to 140". The 1800 Series Double Head Precision grinder, illustrated at left, is now available with a maximum swing of 72" and various table sizes to suit customer specifications.

For complete details, contact Frauenthal of Muskegon, Michigan.



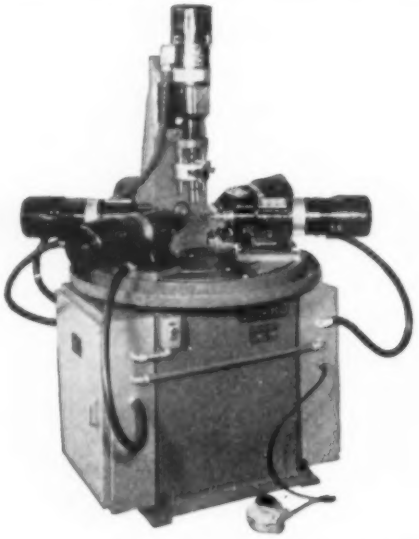
TURBO-JET ENGINES

MACHINE TOOLS — Modern day machine tools are required to produce piece parts to greater accuracy than ever before. Therefore, machine tool components must be more precise to the nth degree. With Frauenthal grinders you can grind collets, chucks, spindle sleeves and similar components under simulated assembly conditions to assure concentricity, parallelism and roundness. Eliminate costly and time consuming hand scraping and grind plated parts prior to and after plating for increased wearability.

TURBO-JET ENGINES — Diffuser cases, rotors, compressor discs, vanes, etc., are components of jet engines ground on Frauenthal equipment. Thin section parts, which are unstable due to their design, are ground on the horizontal rotary table of the 1800 and 3100 Series machines. The compound and spindle angle setting features permit the grinding of surfaces normally inaccessible on conventional equipment.

ORDNANCE — Large bearings and housing components for ordnance applications are ground on the 1800 and 2200 Series grinders. Applications vary from aircraft gun turret bearings to the large turret bearings required for tanks, motorized gun carriages, radar and naval gun mounts.

THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN



Standard machine equipped with a standard vertical bracket

7 HOLES AT ONCE
WITH A
STANDARD RADIAL HOLE DRILLING MACHINE

Why build a special machine for drilling radial holes when a standard machine equipped with Govro-Nelson Automatic Drilling Units will, in many cases, perform the work of a special machine that would cost considerably more!

Any number of drilling units up to eight may be employed, the units being movable not only through 360 degrees on the circular table but also movable endwise on riser plates to meet the requirements of the part being drilled.

The machine may also be used for tapping operations with Govro-Nelson Tapping Units. It has a range of 1/32″ to 3/8″ on drilling operations and 0-80 to 3/8-16 on tapping operations, depending on material and spindle speeds. A single momentary contact start-button causes all units to operate simultaneously.

If you are interested in reducing the cost of your radial drilling and tapping operations, write for price and dimensional data.

WRITE FOR Literature

Automatic **DRILLING UNIT**

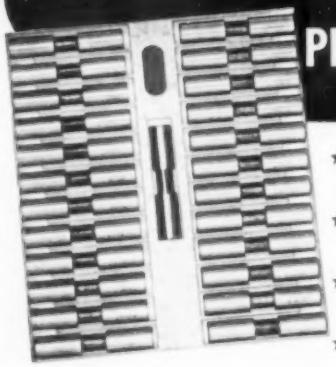
GOVRO-NELSON CO.

Machinists of Precision Parts for 32 Years

1933 ANTOINETTE DETROIT 8, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-244-1

CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64″ from 1/8″ to 1″

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001″ increments and 12 gauges of decreasingly smaller sizes in increments of .0001″. Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D12.

DELTRONIC CORPORATION

1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

USE READER SERVICE CARD; INDICATE A-11-244-2

WAIT! Save Money!
DO THAT JOB FASTER AND BETTER WITH A Severance MIDGET MILL!
Ask for a SEVERANCE catalog today! YOU'LL FIND IT DETAILED, WELL ILLUSTRATED, SUGGESTIVE AND INFORMATIVE. IT INCLUDES LOW REGRINDING PRICES
YES, A SEVERANCE MIDGET MILL MAY WELL SOLVE YOUR PROBLEM AND SAVE YOU MONEY, IF YOU MUST REMOVE GATES, FINS, AND RISERS; BREAK SHARP CORNERS AND EDGES; MACHINE CARBON; FINISH CASTINGS OF ANY MATERIAL; WORK FILLETS, RADII, AND GROOVES; DEBURR OIL HOLES; BLEND WELDED AND ASSEMBLED PARTS; REMOVE FLASH; SMOOTH WELD BEADS; OR ANY OTHER SIMILAR OPERATIONS
MANY STANDARD SHAPES & SIZES TO CHOOSE FROM
SPECIAL SHAPES & SIZES AVAILABLE ON SHORT NOTICE
SEVERANCE MIDGET MILL SET NO 77 IS A POPULAR SET OF 1/2" DIAMETER, 1/4" SHANK, HIGH SPEED MIDGET MILLS. MAKES A FINE GET-ACQUAINTED-SET AND WILL COVER A BIG MAJORITY OF YOUR NEEDS FOR THIS TYPE TOOL. LEAFLET NO.651 GIVES DETAILED INFORMATION AND PRICES.
ASK FOR IT TODAY!
Severance TOOL INDUSTRIES INC.
728 Iowa Avenue, Saginaw, Michigan
CARBIDE HAND FILES
REGRINDING
INSIDE DEBURRING CUTTERS
OUTSIDE DEBURRING CUTTERS
HAND DEBURRING CUTTERS
TUBE END DEBURRING CUTTERS
CHATTER FREE ECONO-SINKS
SPECIAL CUTTERS
MICRO-MILLS & BORE-MILLS
BALL SEAT REAMERS

Representatives and Distributors in principal industrial areas

USE READER SERVICE CARD; INDICATE A-11-244-3

KEMPSMITH MASTER-MILL

It's **NEW**
It's **MODERN**

The Hit of the Show at Chicago!

The enthusiastic reception accorded the new Kempsmith MASTER-MILL at the Machine Tool Show is now history. Thousands of production-minded visitors witnessed the demonstration of this modern milling machine. They agreed, the Kempsmith MASTER-MILL is the finest, most efficient, most productive milling machine of its size and horsepower on the market today, regardless of price. It cuts milling costs to rock bottom by fully utilizing modern cutting tools and techniques. Conveniently located controls permit more rapid set-ups, thereby providing more cutting time. Low initial cost, plus economy of operation, assure highest return on investment. Now available in sizes No. 2 and No. 3—Plain and Universal models. For descriptive literature on these modern milling machines write:

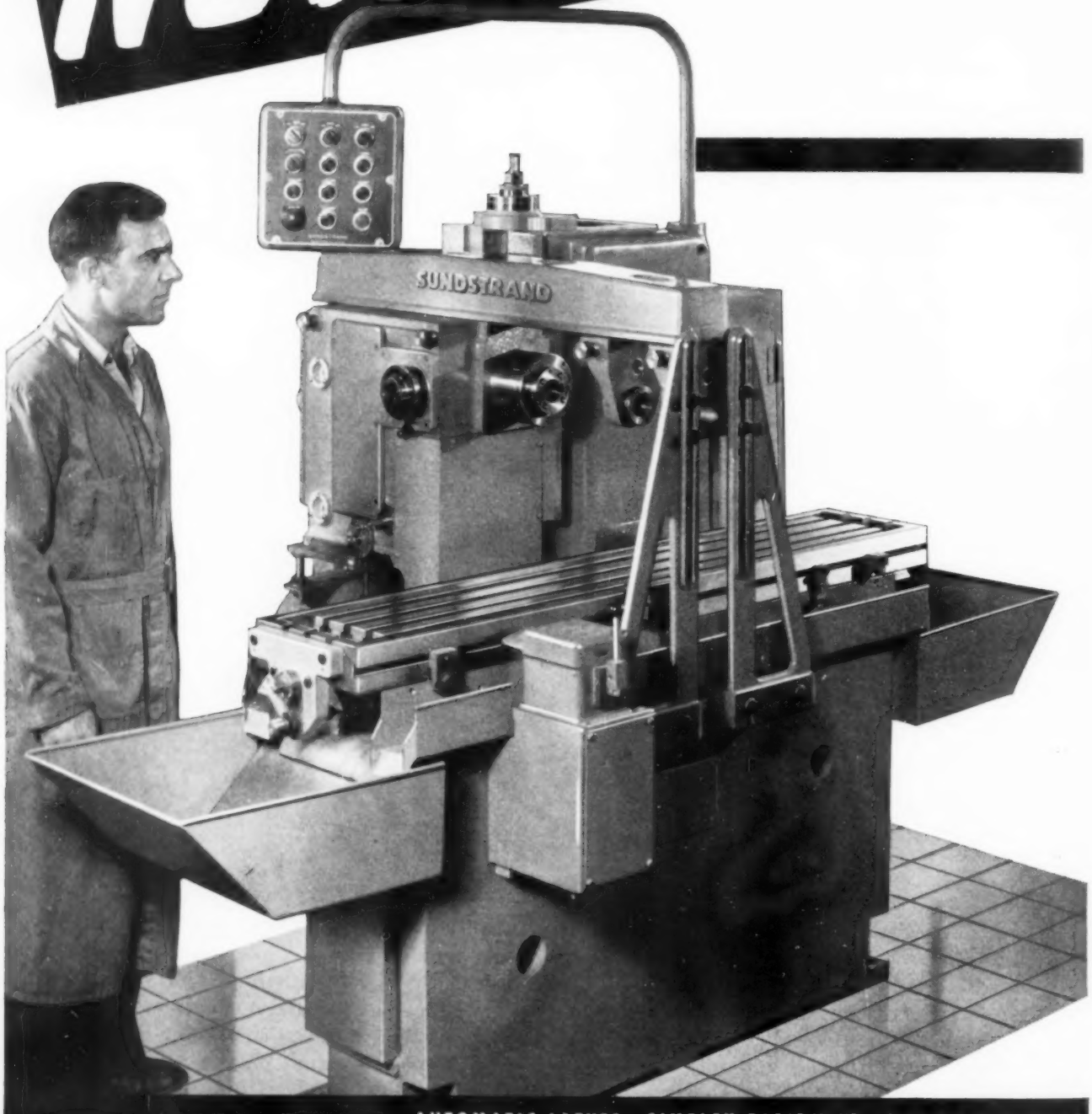
KEMPSMITH MACHINE CO., 1847 So. 71st St. Milwaukee 14, Wis., U.S.A.

Precision-Built MILLING MACHINES Since 1888!

A 8501-1PC

NEW!

SUNDSTRAND
C-1 RIGIDMIL

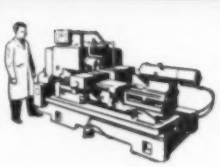


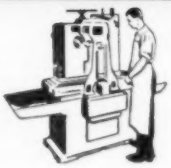
SUNDSTRAND

50 YEARS OF *"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



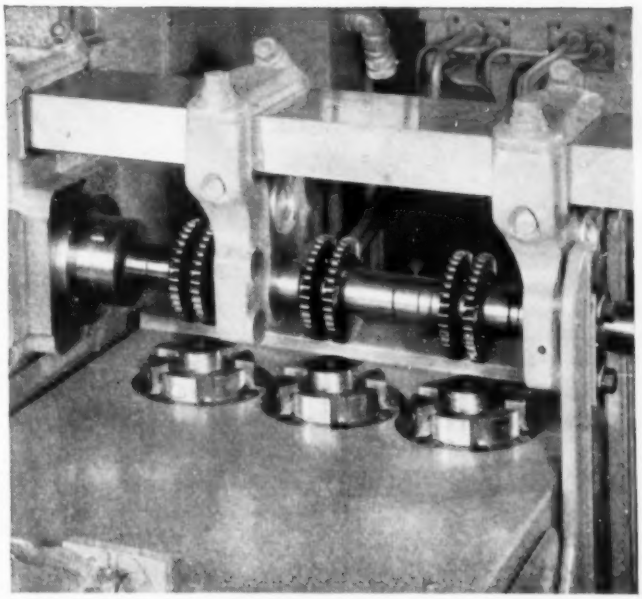


5 H. P. Machine for:

1. Production Milling

2. Easy Tooling of many jobs

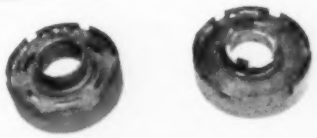
3. Simplified Hydraulic Clamping



Installation above shows Rigidmil equipped with hydraulically operated fixture for holding three transmission parts.

This new Sundstrand Rigidmil has hydraulic feed to the 10½" x 58" table and a maximum stroke of 24 inches. The feed range is from 1" to 100" per minute with rapid traverse of 350 inches per minute.

A feature of the machine is the ease with which the circuit can be arranged for hydraulic clamping. The table feed circuit for the standard machine is arranged so that hydraulic clamping can be added without changing circuit. Spindle head is self contained unit with independent motor drive of 5 H.P. Standard speed range is from 50 to 1500 R.P.M. Speed changes are by pick-off gears with four changes possible with each set of two change gears. Head is carried on a movable column so that the spindle nose can be set from 5" min. to 11¾" max. Machine is available in either a vertical or duplex type as well as the simplex type shown.



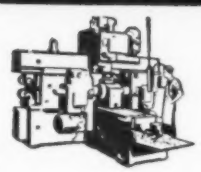
A TYPICAL EXAMPLE

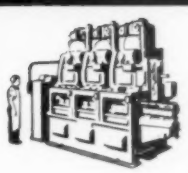
By using the table feed pump as power source, only directional valving was required to provide hydraulic fixture clamping and indexing to this Rigidmil installation. Three pairs of straddle milling cutters are used to mill lugs on transmission part.

For Additional Information

Send part prints, production requirements and amount of stock removal. We will be pleased to furnish you with a preliminary analysis. There is no obligation for this service.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2540 Eleventh St. • Rockford, Ill., U.S.A.

Now... Tapping

SPEED! SPEED! SPEED!

Here's the new high speed tapping attachment for SHORT RUNS—CONTINUOUS PRODUCTION—AUTOMATION!

with the SUPER Jarvis TORQOMATIC

Permanently lubricated ball and needle bearings throughout!

Helical gears—1 to 1 reverse ratio!

Toggle-type clutch gives ultra-sensitive forward and reversing response.

For high speed production tapping—Jarvis TORQOMATIC pays for itself over and over again!

Single collet performs full range of tapping operations.

Here's the business end of the TORQOMATIC . . . gives phenomenal tapping SPEED!

WRITE NOW!
Send for bulletin and prices.

Jarvis
CORPORATION
POWER TOOLS FOR INDUSTRY
DEPARTMENT 6,
MIDDLETOWN, CONNECTICUT

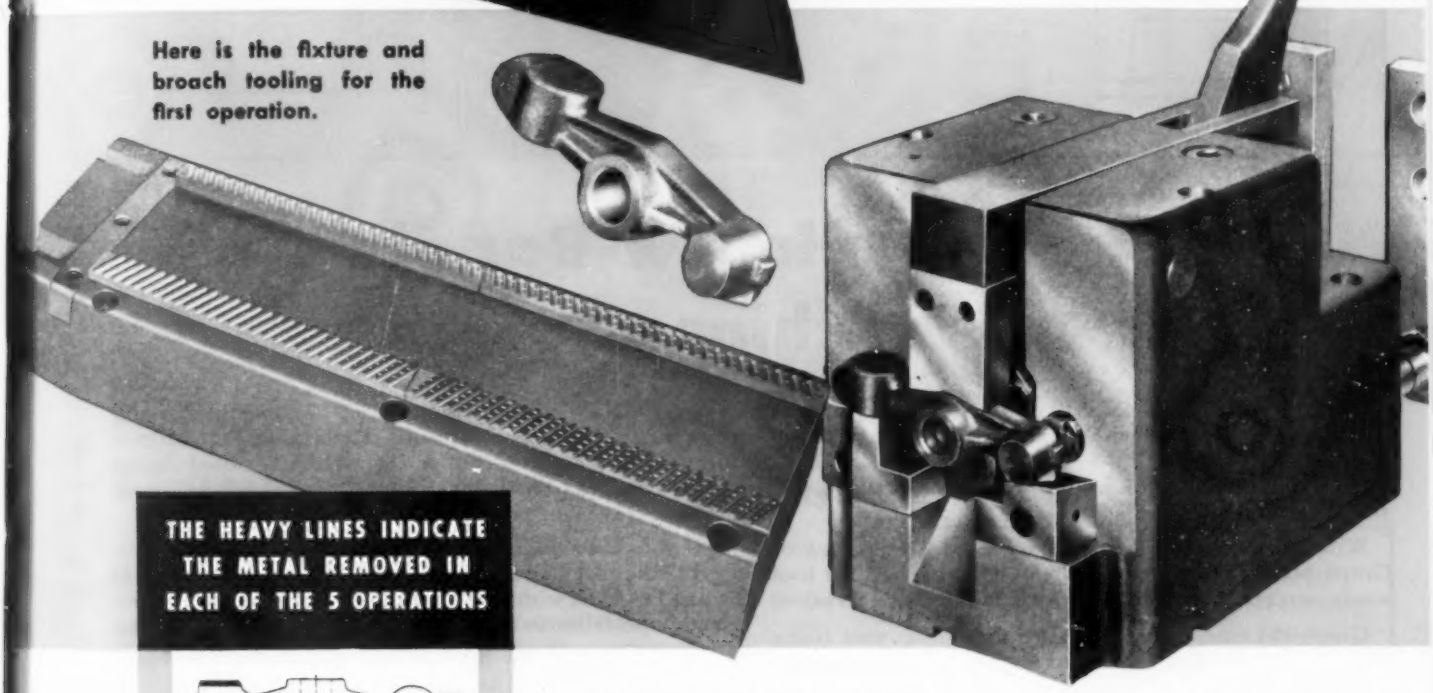
Complete BROACH TOOLING for Customer's Machines

CONTINENTAL CAN RETOOL YOUR PRESENT BROACHING EQUIPMENT FOR HIGH PRODUCTION AND INTERCHANGEABILITY, AT MINIMUM COST

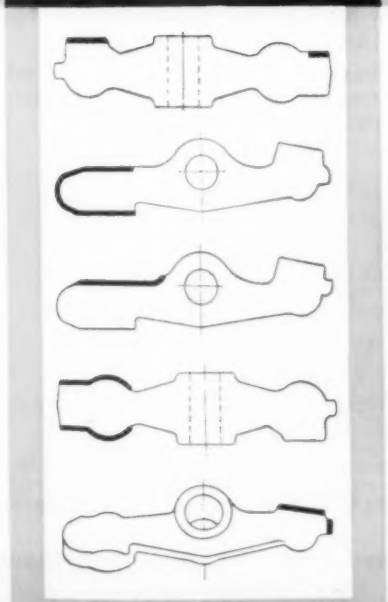
These forged steel rocker arms are economically processed with Continental designed and built broaches, holders and fixtures. The work is done in five operations on two vertical surface broaching machines, one having a single ram and the other a dual ram.

More and more manufacturers are turning to broaching for machining production parts. It's the fastest method of removing stock to precision limits. For a quotation on tooling for your broaching machines call in your local Ex-Cell-O Representative or contact the Continental Division of Ex-Cell-O in Detroit.

Here is the fixture and broach tooling for the first operation.



THE HEAVY LINES INDICATE THE METAL REMOVED IN EACH OF THE 5 OPERATIONS

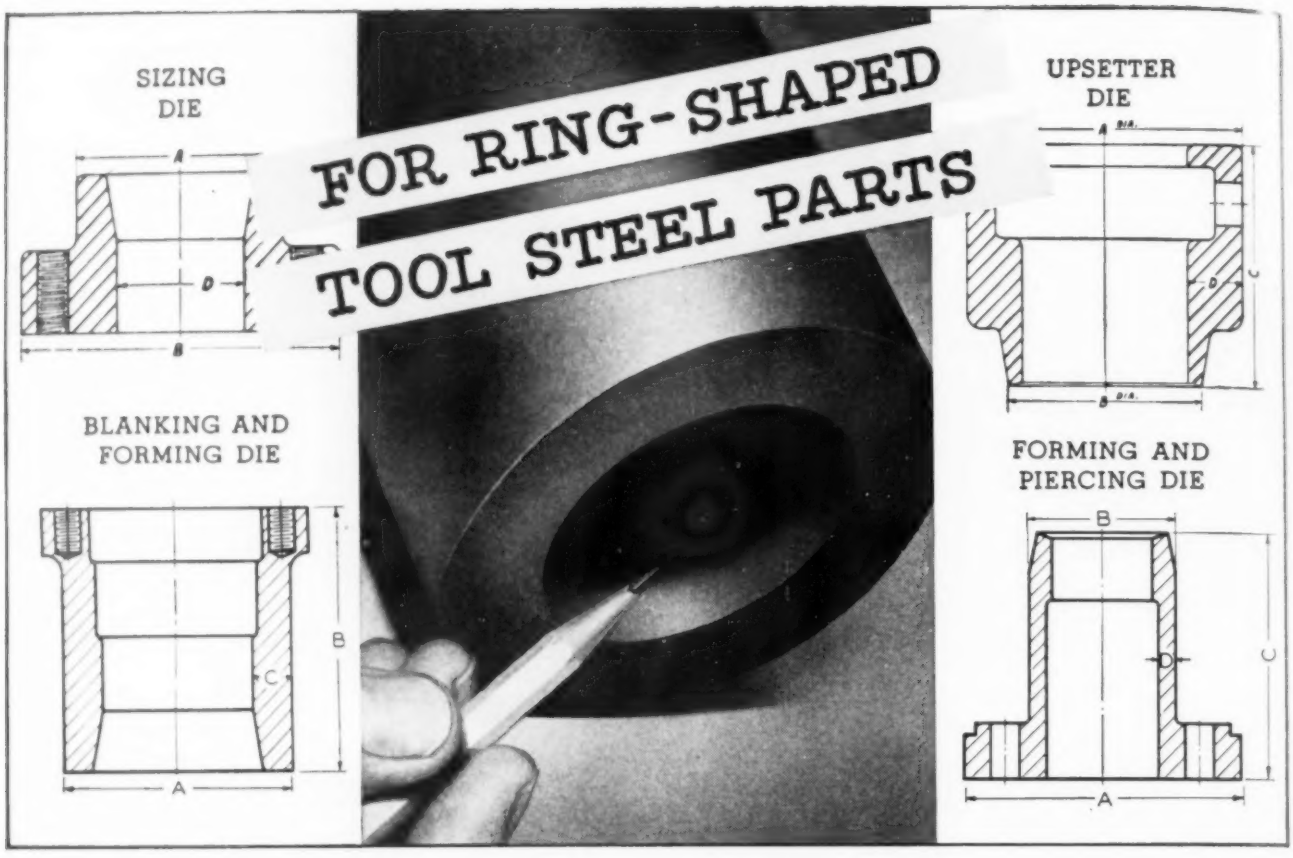


OPERATION 1: Finish broach thrust face and broach locating surface at opposite end. Operation is done on single-ram vertical surface broach machine. Work is located in fixture on floating pin, which allows part to rest firmly on lower anvils when clamped. Spring loaded jacks are wedge locked automatically. Broaches for both cuts are carried in one holder. The only change necessary to accommodate opposite hand parts is to exchange adapters on the fixture.

Continental TOOL WORKS

Division of EX-CELL-O Corporation, Detroit 32, Mich.

55-30



New Graph-Mo Hollow-Bar eliminates drilling, machines 30% faster

MAKERS of ring-shaped tool steel parts who use Graph-Mo Hollow-Bar will tell you it speeds up production, cuts down waste, and saves steel. That's because the hole is already in it. There's no drilling, you start with finish boring.

What's more, you get all the proved advantages of Graph-Mo that have made it one of the most popular tool steels—excellent machinability, wearability, and stability.

Graph-Mo machines 30% faster than other tool steels and has a minimum tendency to scuff or gall. The combination of free-graphite and diamond-hard carbides in its structure gives it exceptional wearability. Users report that Graph-Mo outwears other tool steels on an average of 3 to 1.

Graph-Mo also is the most stable tool steel ever made. For instance, a Graph-Mo steel master plug gage showed less than 10 millionths of an inch in dimensional change after 12 years of use. And Graph-Mo responds uniformly to heat treatment, too.

If you make ring-shaped tool steel parts, make sure you get all the advantages of Graph-Mo Hollow-Bar. Sizes range up to 16″ O.D. with a variety of wall thicknesses. It's made by the specialists in fine alloy steels, The Timken Company.

Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and the Peninsular Steel Co. warehouses.

To find out more about this tool steel, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

Massey-Harris-Ferguson eliminates reworking of finished pieces with Surfindicator. This production tool cuts their machining cost.

"SURFINDICATOR* *cuts our costs by eliminating extra machining"*

The Brush SURFINDICATOR enables the operator to measure, at the machine, the exact surface finish which he is producing. Thus, it allows him to take necessary steps to make this the optimum surface finish from a cost to performance standpoint. The surface finish of these farm implement parts is checked right on the production floor at Massey-Harris-Ferguson Inc., Racine, Wisconsin.

They state: "Using the SURFINDICATOR, we can immediately see if parts are within the range of design specifications for finish. Considerable machining time and cost has been saved by eliminating reworking of finished pieces to meet specifications. The Surfindicator is an asset to our work because of its portability and simple direct measurement."

You can cut *your* costs, simplify *your* inspection with the SURFINDICATOR. Let a Brush representative demonstrate this portable, easy-to-use instrument in your plant. Send coupon today.

*Trade-Mark

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZOELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT AND COMPONENTS

BRUSH ELECTRONICS

Division of Clevite Corporation

SEE THE SURFINDICATOR AT THE NATIONAL METAL EXPOSITION IN PHILADELPHIA, BOOTH No. 1728.

NEW ASA STANDARD SIMPLIFIES SPECIFYING AND MEASURING SURFACE FINISH

One uniform standard for surface finish now replaces many individual practices. You can now specify surface roughness and character of a surface in the same terms as other plants, your suppliers and your customers.

Send for new booklet containing important excerpts on the ASA STANDARD and including information of the SURFINDICATOR . . . the only instrument completely meeting the New Standard.

BRUSH ELECTRONICS COMPANY,
Dept. V-11, 3405 Perkins Avenue
Cleveland 14, Ohio

☐ Please send booklet describing advantages of new ASA Standard B46.1.

☐ Please have your representative call and demonstrate the SURFINDICATOR.

Name _____

Position _____

Company _____

Address _____

City _____ *State* _____

Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BB

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra.

Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material. These machines are solving new forming problems in many plants and could be the answer to yours.

Send for illustrated folder TE-5

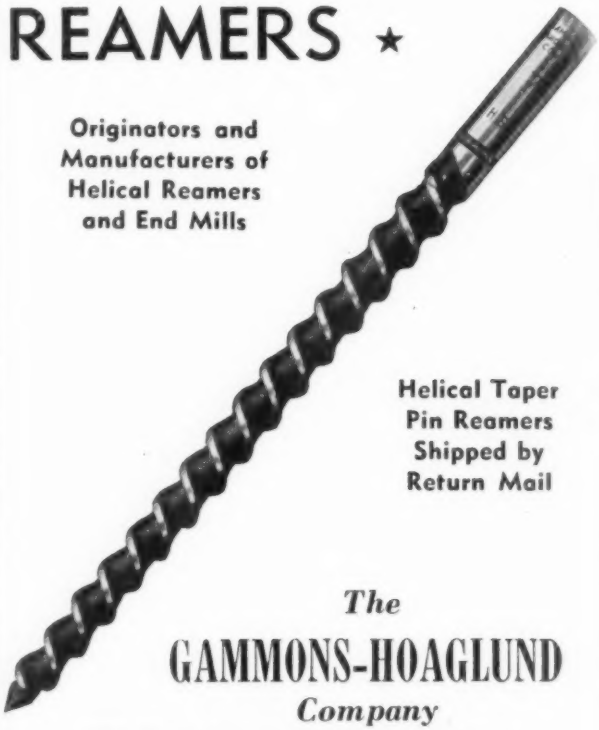
903 North Pitcher St.
Kalamazoo, Michigan

J. A. RICHARDS CO.

USE READER SERVICE CARD; INDICATE A-11-252-1

GAMMONS REAMERS ★

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

The

GAMMONS-HOAGLUND

Company

400 Main Street, Manchester, Conn.

USE READER SERVICE CARD; INDICATE A-11-252-3

KAUFMAN TAPPING MACHINES

BUILT FOR SPECIFIC PRODUCTION JOBS

- Single or Multiple Head Operation
- Precision Depth Control
- Non-reversing Motor Drives
- Pressure Lubricated Lead Screws
- Fast, Accurate Rugged Index
- Other Head Units Available
- And Many Other Worthwhile Features

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

THE MODEL 75-24 KAUFMAN TAPPER

Catalogs Number 754 and 1153 Mailed on request

KAUFMAN

KAUFMAN MANUFACTURING COMPANY

553 S. 29th St. • Manitowoc, Wis.

USE READER SERVICE CARD; INDICATE A-11-252-2

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY

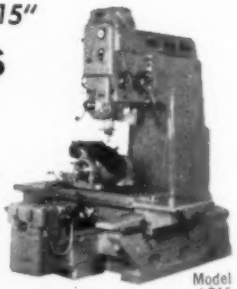
2303D North 11th St. • St. Louis 6, Mo.

USE READER SERVICE CARD; INDICATE A-11-252-4

Fastest initial and repeat settings guaranteed accurate within .00015"

LINDNER JIG BORERS

- Direct reading micro-optical measuring system permanently free of wear. Readings in .00005"
- No gauges, blocks or bars
- Table sizes: 44" x 24"; 32" x 16"
- Over 60 delighted users in U. S. A.
- Send for 20 min. demonstration movie film



Model LB15 with preselective AUTOPOSITIONER

KO CO. INC. INDUSTRIAL IMPOSITORS T. M. REG.

KURT ORBAN company, inc.

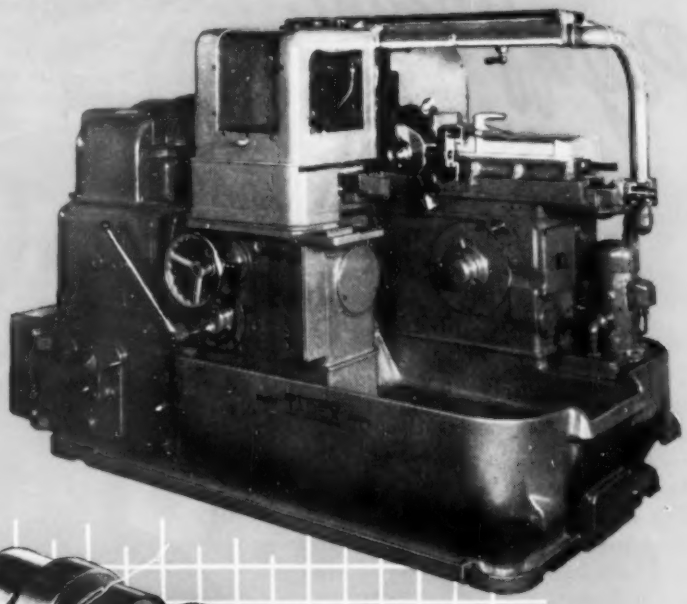
Harborside Terminal Bldg.,
Jersey City 3, N. J.

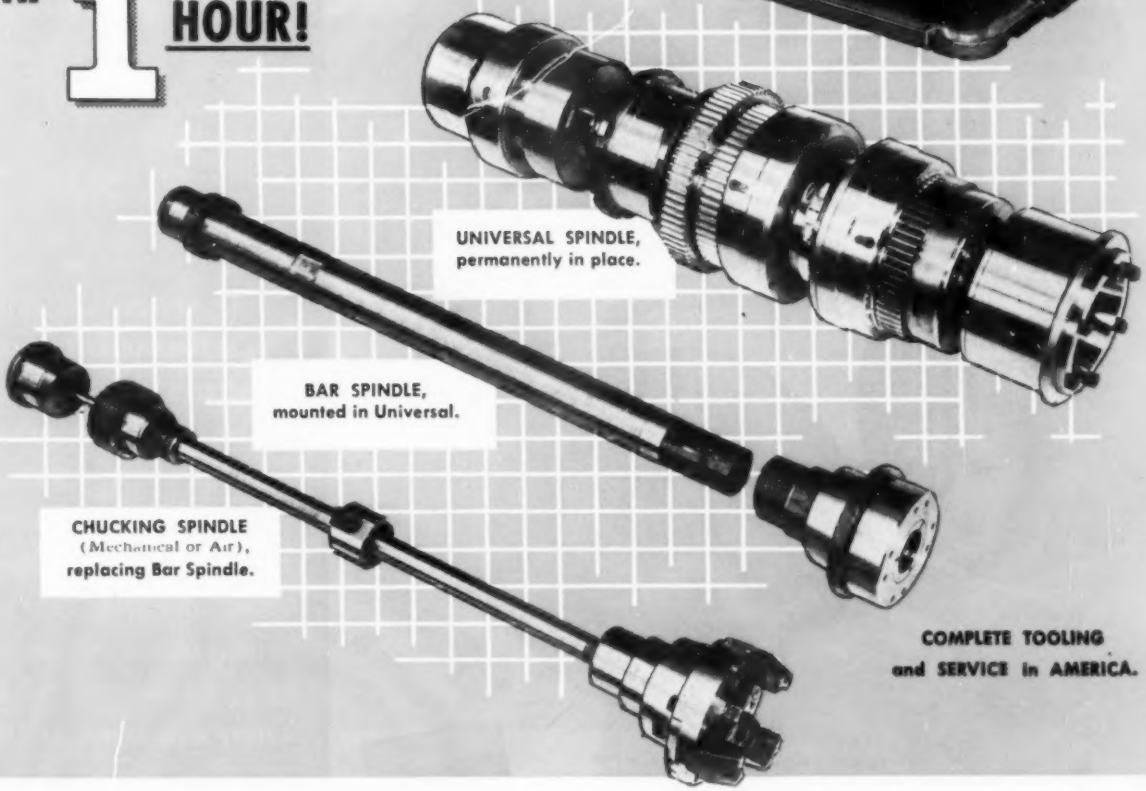
USE READER SERVICE CARD; INDICATE A-11-252-5

TAREX AUTOMATICS

. . . here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

The ability to change from BAR work to a CHUCKING machine in 1 HOUR!





UNIVERSAL SPINDLE, permanently in place.

BAR SPINDLE, mounted in Universal.

CHUCKING SPINDLE (Mechanical or Air), replacing Bar Spindle.

COMPLETE TOOLING and SERVICE in AMERICA.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

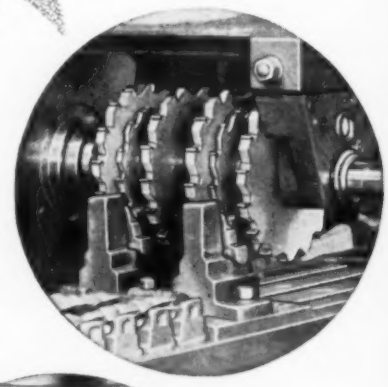
HERE'S THE

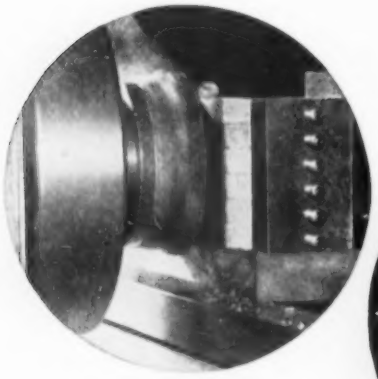
"Payoff Point"

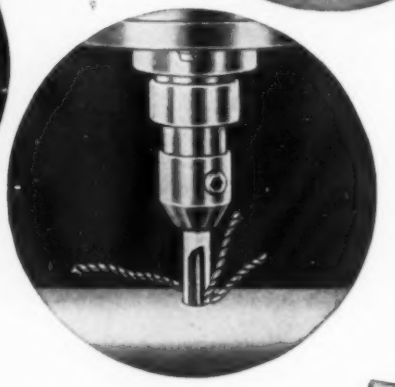
ON ANY MACHINE!

Production speed, product quality and economy depend on one single factor—THE TOOLING IN THE MACHINE!

Nelco carbide tipped tools make *any* machine tool more efficient, more productive. On a new machine, Nelco tools give *maximum performance.* The tool, and be sure it's Nelco, is the PAYOFF POINT on any machining operation. Nelco tools are built to cut—and keep on cutting—to close tolerances and schedules. Finishes are finer; downtime reduced; a size and type for every job a proven fact. For that extra edge in production in new machine or old, look to Nelco at the PAYOFF POINT.







SEND TODAY FOR THE NEW NELCO CATALOG—over 850 standard cost cutting, time cutting carbide tools.

NELCO TOOLS

FACE MILLS
•
SLAB MILLS
•
BORING BARS
•
SPECIAL TOOLS
•
SLITTING SAWS
•
HALF SIDE MILLS
•
KEYSEAT CUTTERS
•
DIAMOND WHEELS
•
SHELL END MILLS
•
TRI-HELIX FACE MILLS
•
HARDENED STEEL DRILLS
•
FINE PITCH FACE MILLS
•
SOLID CARBIDE REAMERS
•
CARBIDE TIPPED TAPER SHANK CHUCKING REAMERS
•
CARBIDE TIPPED STRAIGHT SHANK CHUCKING REAMERS
•
2 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
4 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
3 FLUTE CARBIDE TIPPED CENTER CUTTING END MILLS
•
SOLID CARBIDE TWIST DRILLS
•
No. 50 TAPER SHANK END MILLS
•
INSERTED BLADE FACE MILLS
•
GRINDER AND LATHE CENTERS
•
CARBIDE TIPPED TWIST DRILLS
•
TRI-HELIX SIDE MILLING CUTTERS
•
2 FLUTE CARBIDE TIPPED END MILLS
•
2 FLUTE SOLID CARBIDE END MILLS
•
3 FLUTE CARBIDE TIPPED END MILLS
•
4 FLUTE CARBIDE TIPPED END MILLS
•
4 FLUTE SOLID CARBIDE END MILLS
•
TYPE C
SHELL MILLING CUTTER ARBORS

NELCO TOOLS

For that EXTRA Edge in Production!

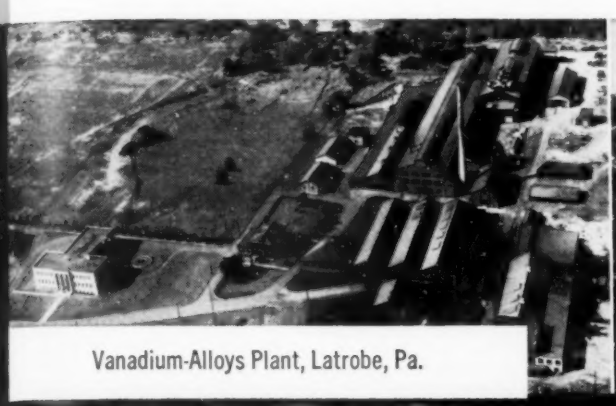
NELCO TOOL CO., Inc. • Manchester, Connecticut

Vanadium-Alloys Steel Company

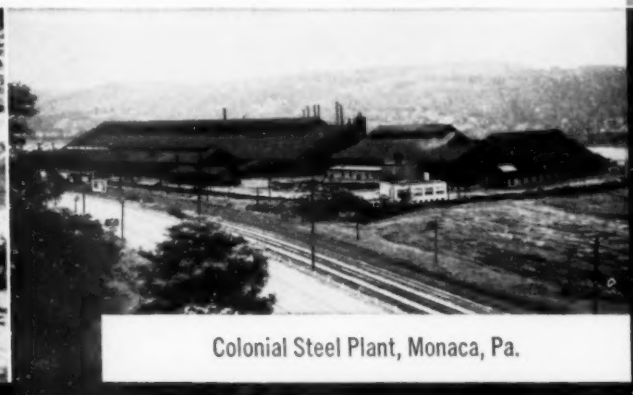
world's largest exclusive manufacturer of Tool Steels

—the capacity, the facilities, the skill and the will to serve you better!

Five manufacturing plants in the U.S. and Canada, twelve branch offices, well-stocked warehouses, a network of distributors in the major metal-working areas and individualized truck delivery provide the measure of our service ability. The First Quality of our tool steels is assured by complete specialization in manufacture and an unremitting concentration upon perfection, every working day in the year.



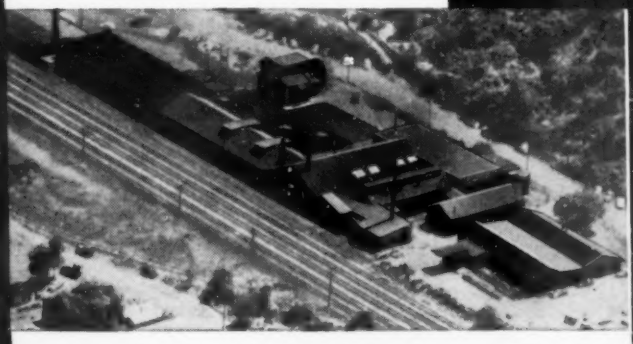
Vanadium-Alloys Plant, Latrobe, Pa.



Colonial Steel Plant, Monaca, Pa.

Anchor Drawn Steel Plant, Latrobe, Pa.

Hot Rolled Products from mills up to 22" diameter—Cold Drawn Products—Precision Ground Products—Plate—Sheet Circles—Forgings. Standard and Special Shapes in High Speed, Die Steel and Special Tool Steel Compositions.



Pittsburgh Tool Steel Wire Plant, Monaca, Pa.

Vanadium-Alloys Steel Canada Limited, London, Ont.

Vanadium-Alloys Steel Company

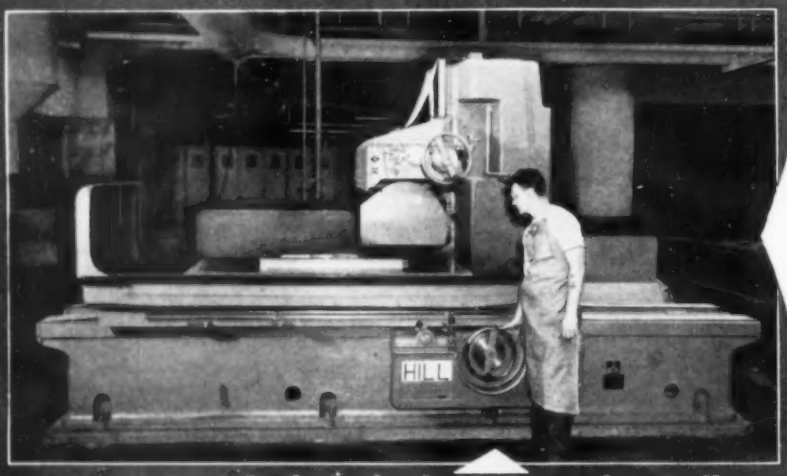
Latrobe, Pennsylvania

Subsidiaries: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni

FIRST QUALITY TOOL STEELS

What HILL GRINDERS Have Done for Others They Will Do for YOU!

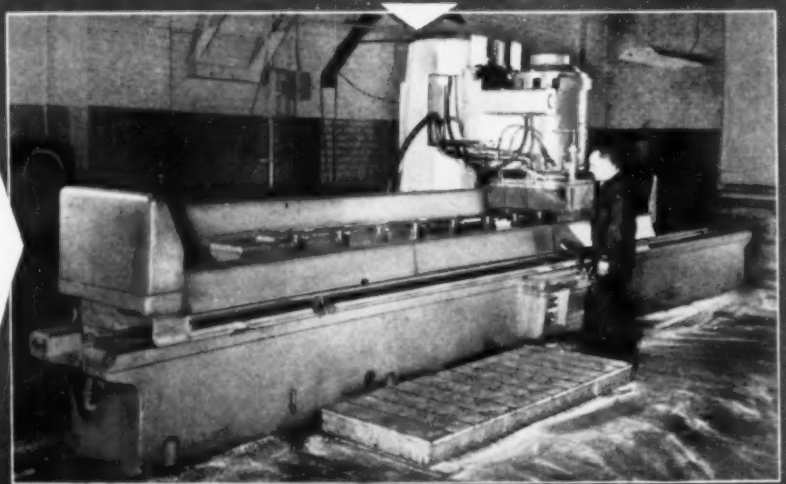
- *Produce a smoother finish and closer tolerances.*
- *Increases man-hour production.*
- *Actual case histories prove definite worthwhile dollar savings over other methods*



Use the "Hill" Horizontal Spindle Grinder for a wide range of grinding — flats, angles, irregular and special shaped surfaces — ideal for maintaining close tolerances with low micro inch finish. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

- **Built in both Horizontal Spindle and Vertical Spindle types.**
- **Choose the most efficient type for YOUR requirements.**

Use the "Hill" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces — recommended for accuracy, speed and finish — features that mean increased precision production. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.



HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES

for the best buy....

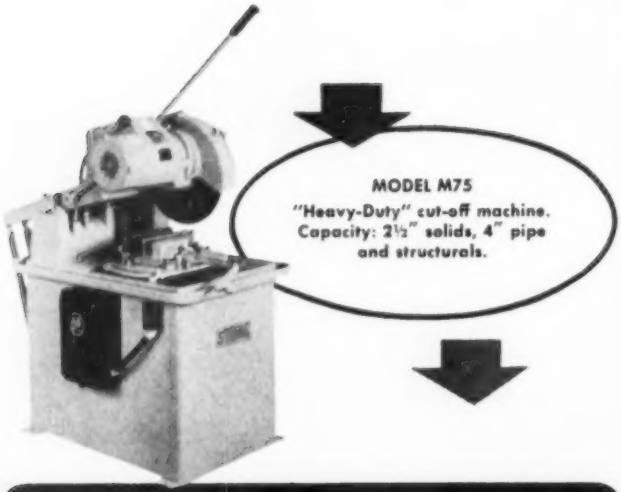
buy **BATH**

GROUND FROM THE SOLID

JOHN BATH & CO., Inc.

28 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS



Cuts hardened tool steel Increased production over 5 TIMES*

A large Detroit tool shop formerly teamed a power hack saw with a band saw for cutting hardened tool steel.

These two machines were replaced by a single model M75 cut-off machine. *Result.... Model M75 increased production over 5 times. Cost data proves tremendous economy of Stone machines compared to other methods.

- Cuts any metal — ferrous or non-ferrous—in 2 to 4 seconds per sq. inch.
- Used for cutting bar stock, pipe, tubing, structurals, etc.
- Leaves milled-like finish with tolerance less than ±.005; reduces the need for further machining.
- No change of characteristics or hardening of stock.

EXCLUSIVE FEATURES BY STONE

- Geared-in-head motor delivers maximum power to cutting edge for greatest efficiency.
- Self-centering vise presents least arc of contact for faster cutting, longer wheel life.
- Vise plate calibrated in degrees permits speedy change-over from straight cutting to angular cutting up to 46°.

OPTIONAL FEATURES

- Semi-Automatic Power Stroke provides simpler operation, minimizes operator fatigue; gives up to 25% longer wheel life.
- Oil Mist Spray attachment for cooler, easier cutting increases saw blade life up to 400% on non-ferrous materials.

Get profit-making equipment from Stone. Our representatives will gladly discuss your cutting requirements without cost or obligation. Just write or phone.

"Cut-off machinery by Stone . . . represented in every major industry throughout the world."

STONE MACHINERY COMPANY, INC.
31 FAYETTE ST., MANLIUS, N. Y.

USE READER SERVICE CARD; INDICATE A-11-258-1

STOP WASTING DRILLS!

NEW LIFE FOR OLD DRILLS WITH BLACK DIAMOND DRILL GRINDER!

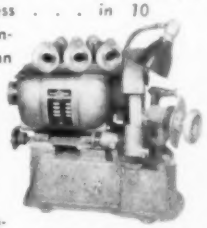
1 INSERT

2 PUSH

3 TWIST

4 GRIND

The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



FREE BULLETIN

Get all the facts! 4 page illustrated bulletin gives complete story. *Write Today!*

BLACK DIAMOND
SAW & MACHINE WORKS
NORTH AVE. NATICK, MASS.

USE READER SERVICE CARD; INDICATE A-11-258-2

Cerromatrix Does It!

Slide Rods Anchored at ½ Cost of Machining for Drive Fits.

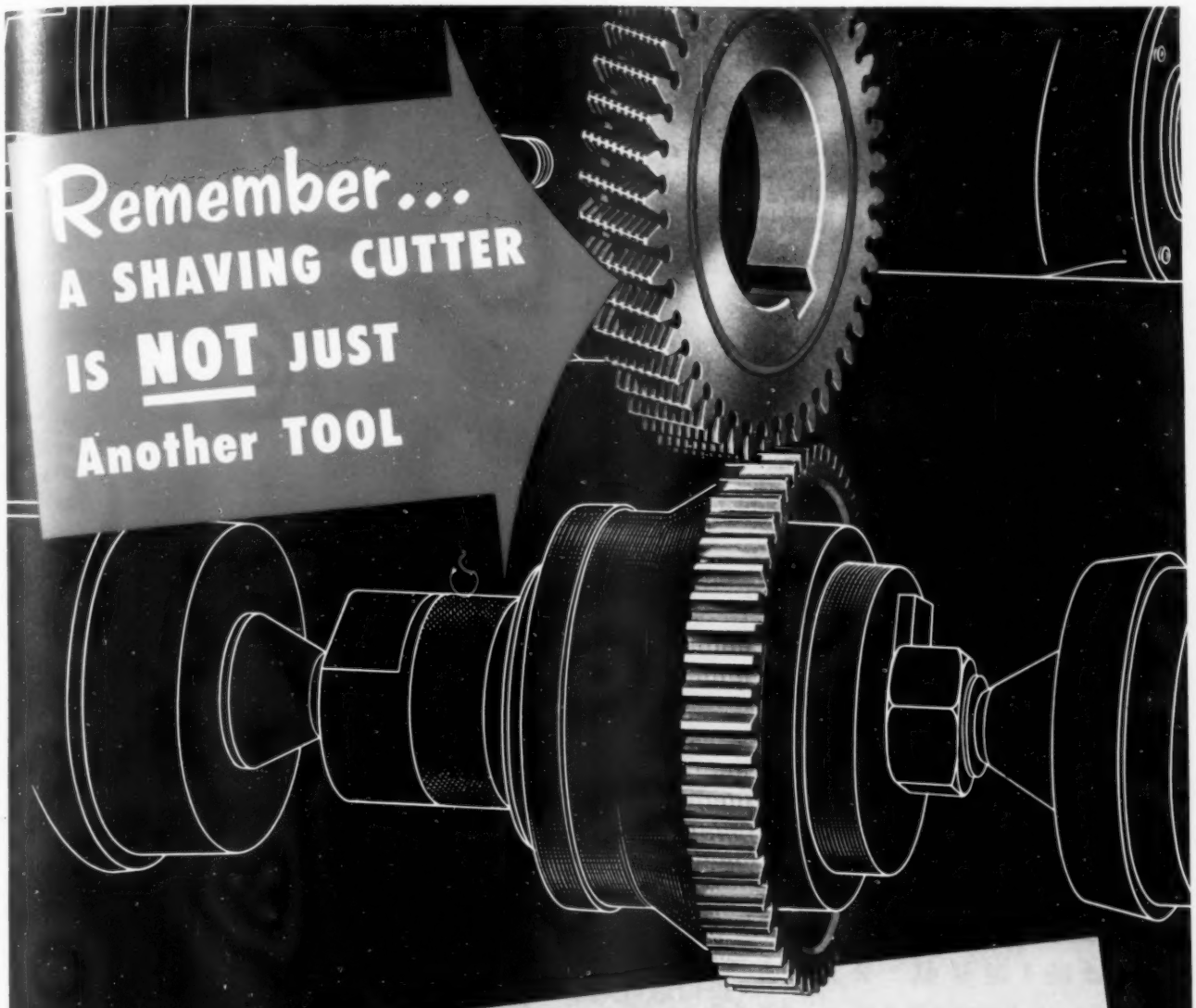
HERE'S HOW:

Grooved slide rods were inserted in cored, oversize holes and aligned in a holding fixture. Cerromatrix was melted and poured in place. When frozen, Cerromatrix expanded to give a tight fit that exceeded the life of the machine. Proven by 20 years in service.

Find out how YOU can save money in anchoring bearings, bushings and non-moving parts in machine building by writing for Bulletin A1.

CERRO DE PASCO CORPORATION
296 Park Avenue, New York 5, N. Y.

USE READER SERVICE CARD; INDICATE A-11-258-3



Remember...
A SHAVING CUTTER IS NOT JUST Another TOOL

EXPERIENCE

Making the successful rotary gear shaving cutter requires not only the consummate skill of the master toolmaker, but also a thorough knowledge of gear practice. The latter is acquired only the hard way, by experience — a lot of it.

No group anywhere has had as much cutter experience as Red Ring engineers who developed Rotary Gear Shaving. They have been learning more and more about cutters for the last 25 years — and still are.

DEVELOPMENT

It would be convenient indeed if all cutters could be made to a standard design, interpolating only for variations in basic gear characteristics.

Unfortunately, there are many variables which often make modifications essential. But, how much modification? Where to apply it? The answer again is EXPERIENCE with the performance data to substantiate it.

Service of this type provided by Red Ring engineers can make a valuable contribution to your gear processing operations.

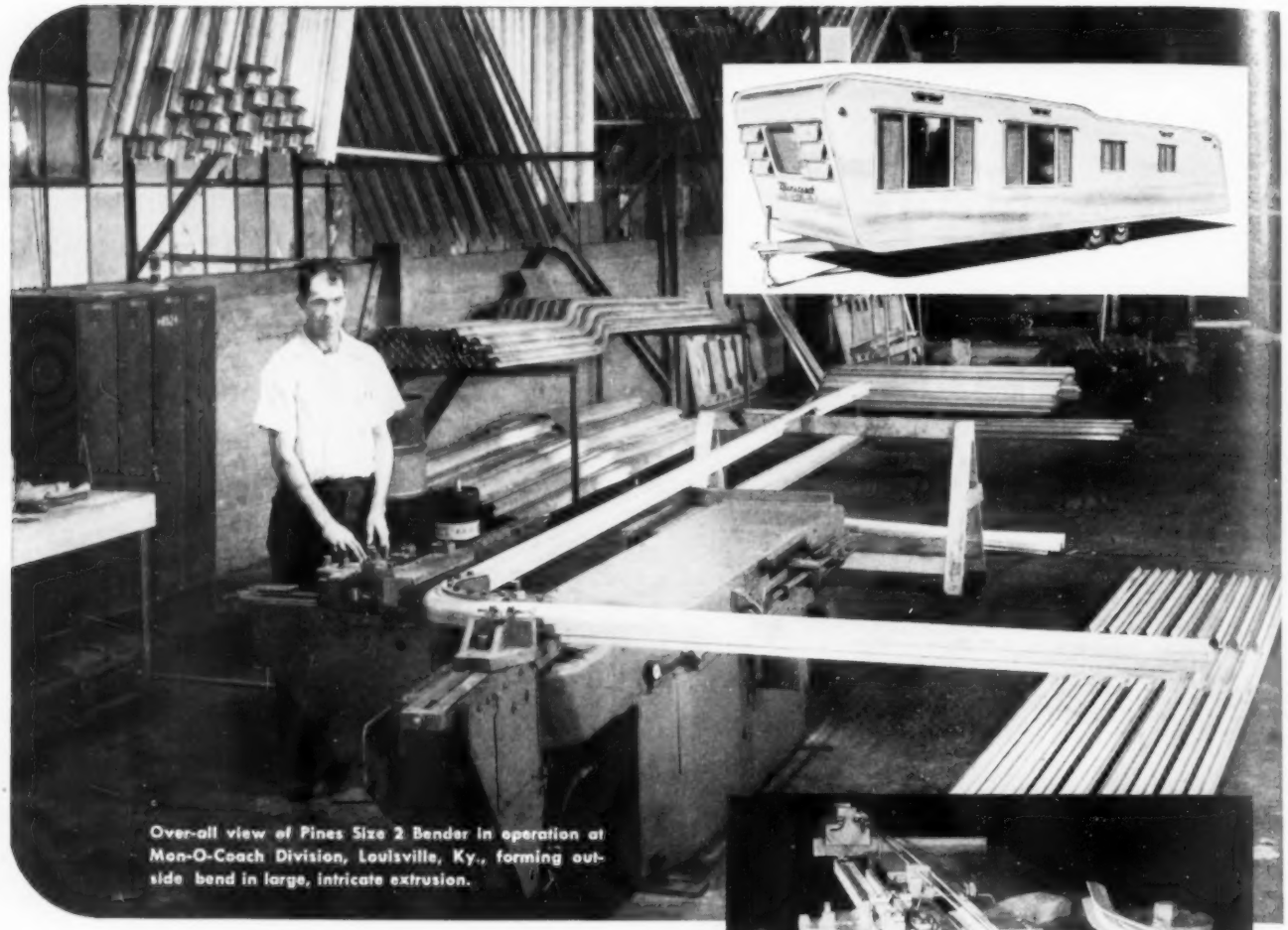
Next time you buy shaving cutters be sure you are getting the maximum.

7162

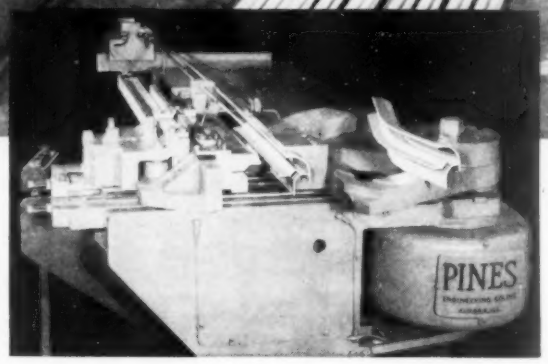
NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Over-all view of Pines Size 2 Bender in operation at Mon-O-Coach Division, Louisville, Ky., forming outside bend in large, intricate extrusion.



▲ View of tooling for making offset bend in opposite direction. Two plug-type mandrels support inner walls. Smooth, neat bends are formed at a bending arm speed of 6.0 r.p.m.

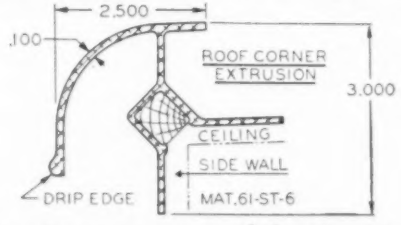
PRODUCTION BENDING ALUMINUM EXTRUSIONS THE "PINES-WAY"

The new, luxurious Mon-O-Coach Mobile Home, manufactured by Mon-O-Coach Division, Ironwood Trailer Coaches, Inc., Louisville, Ky., is a marvel in modern metals engineering. It features all-aluminum structural members which are now cold formed and shaped accurately by production bending methods. Previously, many of the bends were formed by slitting and hand-bending a section, then re-joining the slotted section by welding. Today, a Pines Size 2 Production Bender handles these jobs fast and efficiently.

Slitting and Welding Operations Eliminated

All curved sections are now cold formed in a single operation, including an offset bend in an opposite plane in one of the most ingenious extrusions probably ever developed for the automotive industry. Shown in drawing, this large unique extrusion, incorporating a ⅝" wood section, is a top corner section which serves as a means of fastening top, sides, and front panel members together. Tooling by Pines forms neat, smooth bends without excessive distortion or wrinkling, completing the piece with the wood section in place. Previous slitting and welding operations are eliminated.

▼ Cross-section of Mon-O-Coach's intricate, top corner extrusion. Hollow center incorporates ⅝" wood section installed before bending—serves as a means for fastening wall studdings.



Write FOR MORE DATA

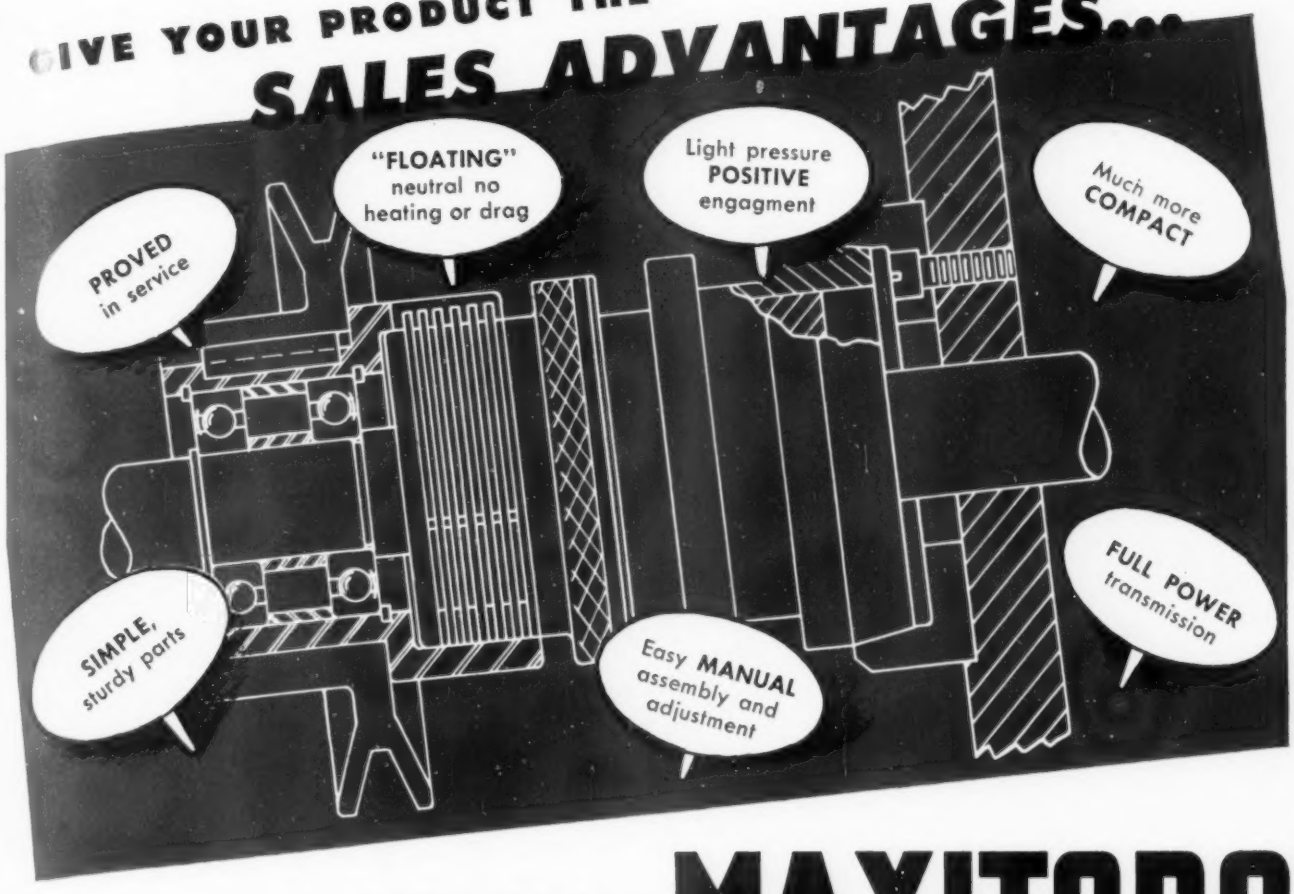
If you would like more data on production bending of aluminum extrusions the "Pines-Way", write for free copies of "Pines News". Or ask for a Pines engineer to call and assist you with any production problem.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery · 693 WALNUT · AURORA, ILLINOIS

PRODUCTION BENDING · DEBURRING · CHAMFERING MACHINERY

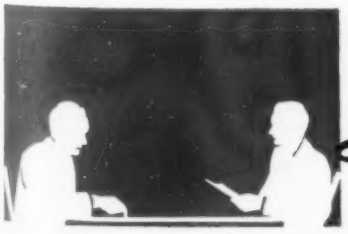
GIVE YOUR PRODUCT THE SALES ADVANTAGES...



...OF A PROVEN MAXITORQ floating disc CLUTCH

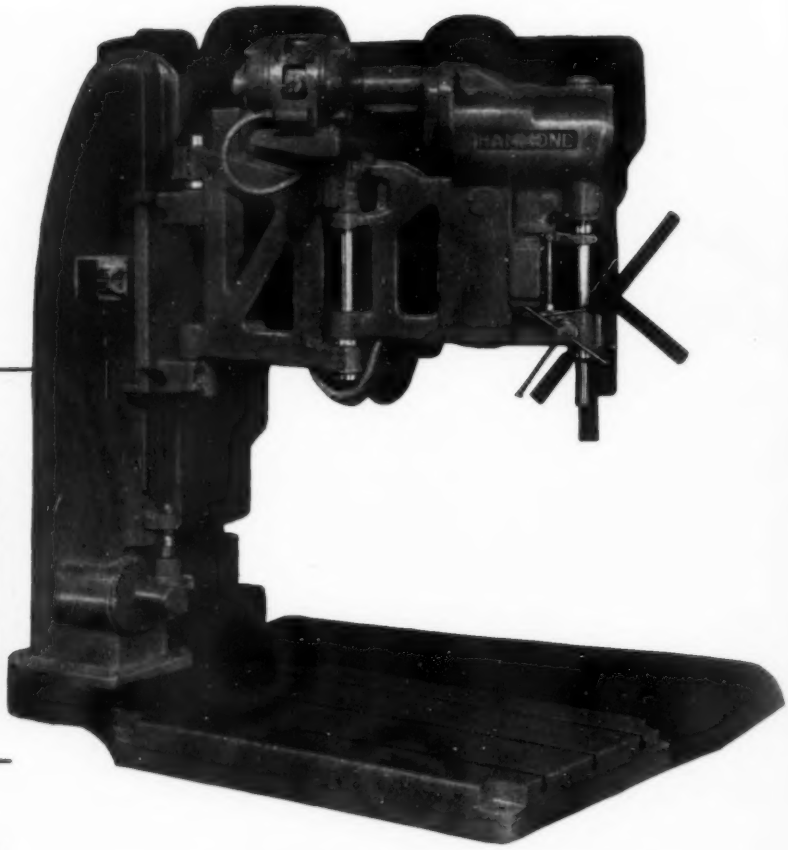
The above line drawing illustrates a single MAXITORQ Clutch arranged for single V-belt drive with a special sliding beveled shifter sleeve acting as a light brake.

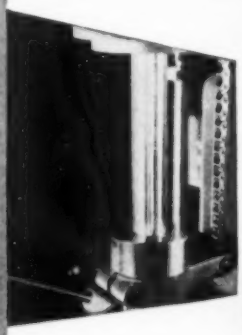
Yes, there are many types of MAXITORQ . . . single, double, overload release . . . to meet every installation need. Get our comprehensive technical data . . . let our engineering department help you work out special drive problems. Write or phone: Dept. TE-11, The Carlyle Johnson Machine Company, Manchester, Conn.

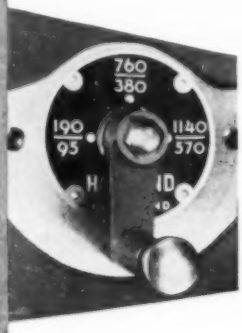


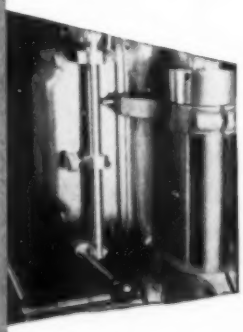
Let's talk MAXITORQ

SCJ59









FOOTBURT

FOR *faster* RADIAL

DRILLING AND TAPPING

■ Hammond Radial Drilling and Tapping Machines may be spotted in the production line for drilling, tapping or reaming. With its unique Bracket Type construction the spindle can be swung quickly from hole to hole. Six Quick Speed Changes are instantly available and the Hammond Tapping Reverse is very fast and convenient to operate.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio

Detroit Office: General Motors Building

☆engineered for production

FOOTBURT

MACHINE TOOLS

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-262

STANDARD TOOL

...serving Industry since 1881

Complete line stocked by the Standard Tool Distributor in your area

● The Standard Tool Man, Serving Industry Since 1881, can recommend changes in drill grinds, speeds and feeds that will enable you to make substantial savings in your plant.

The Standard Tool Man is a specialist in cutting metal and cutting costs. His service is backed by Standard's modern research laboratory. He is at your service without obligation.

Call him!

STANDARD TOOL CO.

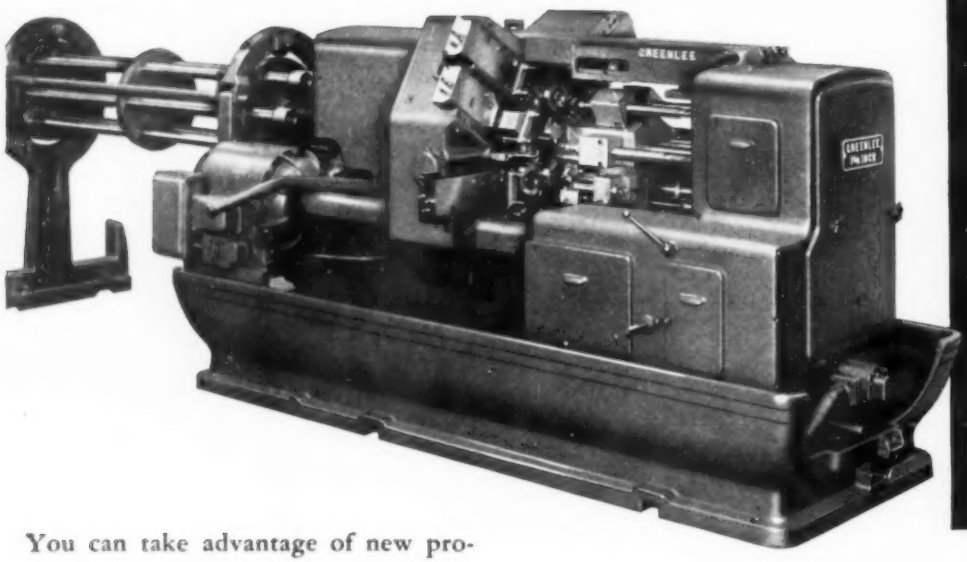
3950 CHESTER AVENUE CLEVELAND 14, OHIO

STANDARD TOOL CO.

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills - Reamers - Taps - Dies - Milling Cutters - End Mills - Hobs - Counterbores - Carbide-Tipped Tools - Gages*

now... greater accuracy, faster production



WITH GREENLEE SIX-SPINDLE AUTOMATICS

You can take advantage of new production techniques...attain higher levels of efficiency with the improved Greenlee 6-Spindle Bar Automatic. Its advanced design opens the door to some real profit opportunities. • These design improvements are fully described in a catalog recently issued. Let us send you a copy today. Find out how Greenlee Automatics can save time and money in your plant. It will pay you to investigate.

IMPROVED SPINDLE CONSTRUCTION

The spindle has been completely redesigned to assure greater accuracy at higher speeds. True running... the new Greenlee spindle has five widely spaced, preloaded, angular-contact, precision ball bearings. Entire spindle is dynamically balanced for smooth operation. Metallic seals, labyrinth and friction washers with line contact provide maximum heat dissipation.

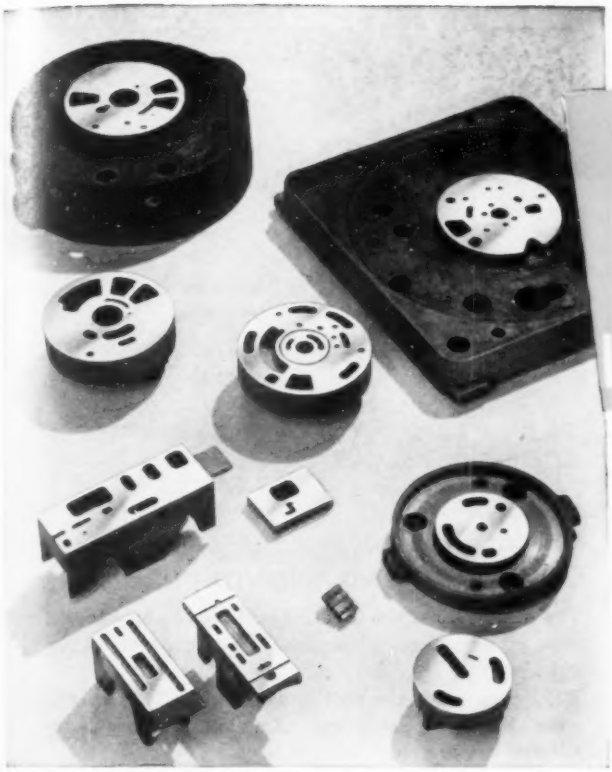
INCREASED SPEED

Spindle speed range has been increased. Enables you to take full advantage of the top efficiency and peak performance which carbide and high-speed tooling offer. Reduces down-time losses and tool costs.

WRITE FOR CATALOG No. A405

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1991 Mason Avenue
Rockford, Illinois



Get Precision Flatness, Finish and Parallelity on Valve Parts Like These . . . In Production Quantities With a Lapmaster®

Air brake valve parts like these are being production lapped on JOHN CRANE Lapmasters every day at a tremendous savings in time and money. For instance, one of the rotary valve seats shown here formerly required over two hours of lapping time to pass the "no leak" bubble test — time has now been cut to ten minutes on the Lapmaster.

This is the machine for you if you are looking for precision flatness and finish in quantity on all forms of ferrous and non-ferrous metal, ceramics, plastics or crystals. Lapmasters readily lap to the extremely close tolerance of one light band (.000011") or less. They also produce a fine finish to as low as 1 RMS.

You are invited to send us a few sample parts including surface finish specifications and approximate production requirements. Our lapping laboratory will then be in a position to provide you with complete facts on the application of the Lapmaster to your work. There is no obligation.

Crane Packing Co., 1823 Belle Plaines Avenue, Chicago 13, Ill.
In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont., Canada

Agitator tank keeps abrasive and vehicle in proper suspension
Solenoid valve controls correct flow of abrasive
Abrasive mixture flows down feed track
Mixture is evenly distributed over lap plate by rotating conditioning rings
Spent mixture drains off through serrations in lap plate
Conditioning rings serve as standard workholder
Conditioning rings keep lap plate flat automatically

*Protected by United States and Foreign Patents.

FREE TECHNICAL DATA
on the Lapmaster is available on request, also information on measuring flatness. Write for your copies today.

Lapmaster® DIVISION

CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

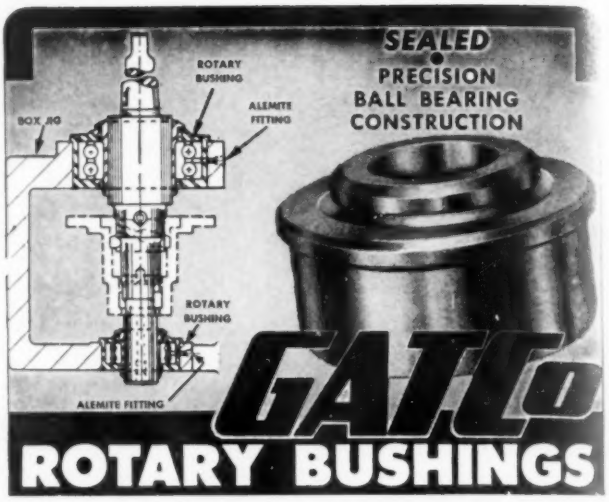
Major Vulcan Services

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.

7300 LORAIN AVENUE • DAYTON 10, OHIO

USE READER SERVICE CARD: INDICATE A-11-266-1



FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.

42324 ANN ARBOR ROAD, U.S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

USE READER SERVICE CARD: INDICATE A-11-266-2

Over 85% of the torque wrenches used in industry are

Sturtevant TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams
...inch ounces
...inch pounds
...foot pounds

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. *Sturtevant* CO.
ADDISON QUALITY ILLINOIS

USE READER SERVICE CARD; INDICATE A-11-266-3

CUSHMAN chucks

give Chuck-ability

CHUCK-ABILITY: The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . .through design and selection of the right work-holding devices.

. . the *New* Accra-Set* Chucks

- Ideal for precision bar work.
- Quick, simple, minute adjustment.
- Repeats within .0005" or better T.I.R.
- Because of extreme accuracy and jaw capacity, one Accra-Set* Chuck can replace *even* the most accurate collet chuck and its range of collets.

* Patent applied for.

Available with 3 or 6 jaws in 6", 8" and 10" sizes. Adapter plates required for mounting.

THE CUSHMAN CHUCK COMPANY

Hartford 2, Connecticut

a world standard for precision

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials.

CUSHMAN CHUCKMAN CHUCKS Exclusively SINCE 1862

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws

HOW TO BUY CUT-OFF WHEELS

FOR CLEANER CUTTING AND LONGER WHEEL LIFE

. . "More Use per Dollar"

Look for a wheel specially engineered and bonded to give you maximum cutting efficiency for your particular cut-off operations.

Safe, fast, clean metal cutting for sustained periods with a wheel that cuts freely, means savings in both time and money. You should look for a wheel that permits you to cut at high speed without burning, one that will leave no burr or discoloration and will last longer. To give you these advantages, the wheel you buy should be custom-bonded for your specific cut-off job . . . to assure smooth, free-cutting action whether you work with hardened or soft steel, light gauge tubing, critical alloys, etc.

Specify the wheel designed specifically for improved cutting on *your* job . . . specify Manhattan Cut-Off Wheels.

MANHATTAN CUT-OFF WHEELS

Manhattan developments in both rubber and resinoid bonds have greatly increased the cutting efficiency and long life of Manhattan Cut-Off Wheels. In factories where records are kept of the number of cuts per wheel, Manhattan wheels have proved they do a better job, longer . . . permit faster, cleaner cutting on *all* types of metals. Manhattan Cut-Off Wheels are manufactured in the widest range of types and sizes. Manhattan sales engineers will aid you in specifying the exact one for your operations and show you how you can save time and money—get "More Use per Dollar"—at your plant with Manhattan Cut-Off Wheels and other types of high speed, heavy duty wheels.

RM-527

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-268

TAPS & GAGES *by Card*

Now, Card brings you a precision line of gages along with renowned Card taps. You can specify and use both with complete confidence, knowing that whatever the job demands, you'll get top performance. We assure you that the new line of gages guarantees the same quality that has made Card taps famous over the past 81 years.

Contact your local Card Distributor for prompt deliveries and helpful service.

The CARD Quality

S. W. CARD MANUFACTURING CO.

MANSFIELD · MASSACHUSETTS

Division of Union Twist Drill Co. **TAPS · DIES · SCREW PLATES · GAGES**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-269

Talking About Die Sets

WITH

PHIL MARSILIUS

Vice-President
The Producto Machine Co.

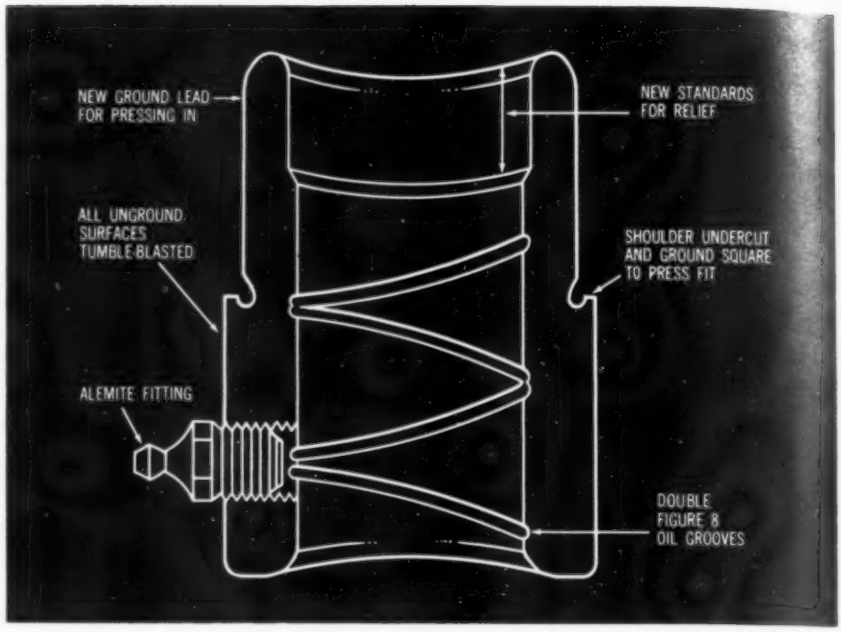
Lubricate for Longer Life—Faulty or insufficient lubrication of guide pins and bushings can result in a rapid reduction in the accuracy of die operation. Since the relationship between wear and friction is a direct ratio, proper lubrication greatly reduces wear and increases the useful life of pins and bushings. There are many fields of thought as to the type of lubricant best suited to die set operations at different speeds and varied accuracy requirements. The type used depends on the experience of the press-room foreman. The method of application also varies widely to suit individual needs.

Standard lubrication methods involve a simple oil groove in the bushing. Here are a few inexpensive systems using the guide pin bushing as a source of lubrication: 1. Relief in the top of bushing is loaded with oil or grease; 2. Oil caps that feed oil into either a circular or Figure 8 groove in bushing through a hole in bushing wall; 3. An oil or grease fitting through which lubricant is forced manually as the need arises; 4. An oil reservoir cup that fits snugly over pin and from which oil is dipped onto bushing with each stroke of the press and is drawn up to completely coat bearing surface of pin for next downward stroke; 5. A steel oil-retaining ring containing a felt washer that fits over pin and slides up and down by spring-loading action or is attached to bushing.

Guide pins also have been made with oil grooves around the circumference or with splines or slots along the length, fed from inside through small connecting holes. Here, of course, bearing surface is somewhat reduced and pins tend to pick up dirt or chips.

Another method minimizes the amount of lubrication required. Bushings are made of bronze or other "soft" materials which hold lubricant in their surface while at the same time reducing friction normally encountered with like metal contact.

Whatever method you choose, proper lubrication will add life to your die sets and help maintain die accuracy.


NEW GROUND LEAD FOR PRESSING IN
NEW STANDARDS FOR RELIEF
ALL UNGROUND SURFACES TUMBLE-BLASTED
SHOULDER UNDERCUT AND GROUND SQUARE TO PRESS FIT
ALEMITE FITTING
DOUBLE FIGURE 8 OIL GROOVES

Cutaway drawing of new Producto bushing

NEW PRODUCTO BUSHINGS IMPROVE DIE SET ACCURACY, APPEARANCE AT NO EXTRA COST

Producto has engineered five important new design features into its master bushings*—the heart of the die set—which provide greatly improved accuracy and appearance *at no additional cost to users:*

1. NEW STANDARDS FOR RELIEF give greater bearing surfaces, improve accuracy. 2. GROUND SHOULDERS seat bushings square to punch holder, guaranteeing perfect alignment. 3. NEW GROUND LEAD ON PRESS FIT starts bushing into punch holder easily. 4. DOUBLE FIGURE 8 OIL GROOVES fed by grease fitting provide a constant source of lubrication to pin and bushing. (Optional spring-loaded grease cups are available.) 5. TUMBLE-BLASTING OF ALL UNGROUND SURFACES polishes surfaces in areas normally not finished after hardening.

These innovations are typical of the steps being taken to keep Producto's die set quality abreast of its service.

If you would like to receive *Die Set Digest,* our new, fact-filled quarterly, just drop us a note. And remember, for precision die sets fast, call your nearest Producto branch.

*"Popular size" master die sets already have these new bushings. They will soon be available on all sizes.

THE PRODUCTO MACHINE COMPANY
930 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	Philadelphia	MO 4-1010
Chicago	ES 8-3307	Kansas City	BA 9033	Rochester	GL 1810
Cleveland	SU 1-6158	Los Angeles	TR 9826	St. Louis	FR 3370
Dayton	MU 1651	New York	WO 4-7484	or check the Yellow Pages in	

any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

Precision Die Sets

Down

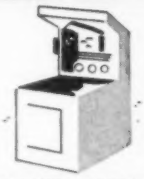
MANUAL

SEMI-AUTOMATIC

the years

with

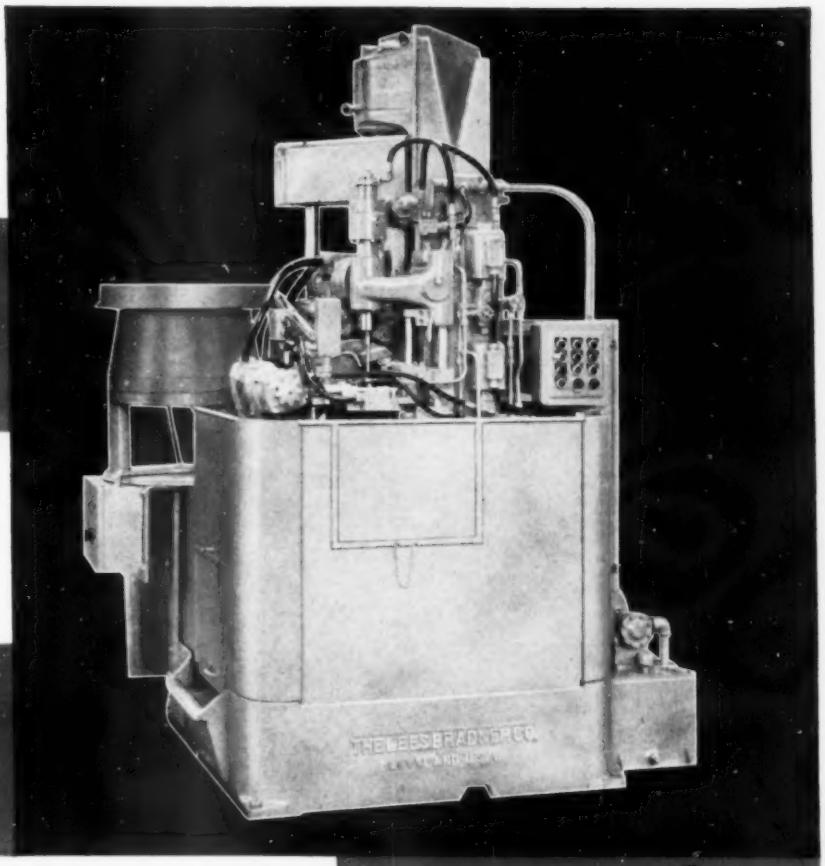
AUTOMATIC



SELF LOADING & UNLOADING

machine

tools



...and now the NEWEST

AUTOMOTION®

MACHINES THAT THINK FOR THEMSELVES

Moving ever forward in the development of new gear-hobbing methods, Lees-Bradner now presents a hobber that *electronically* corrects tolerances while the machine is in action.

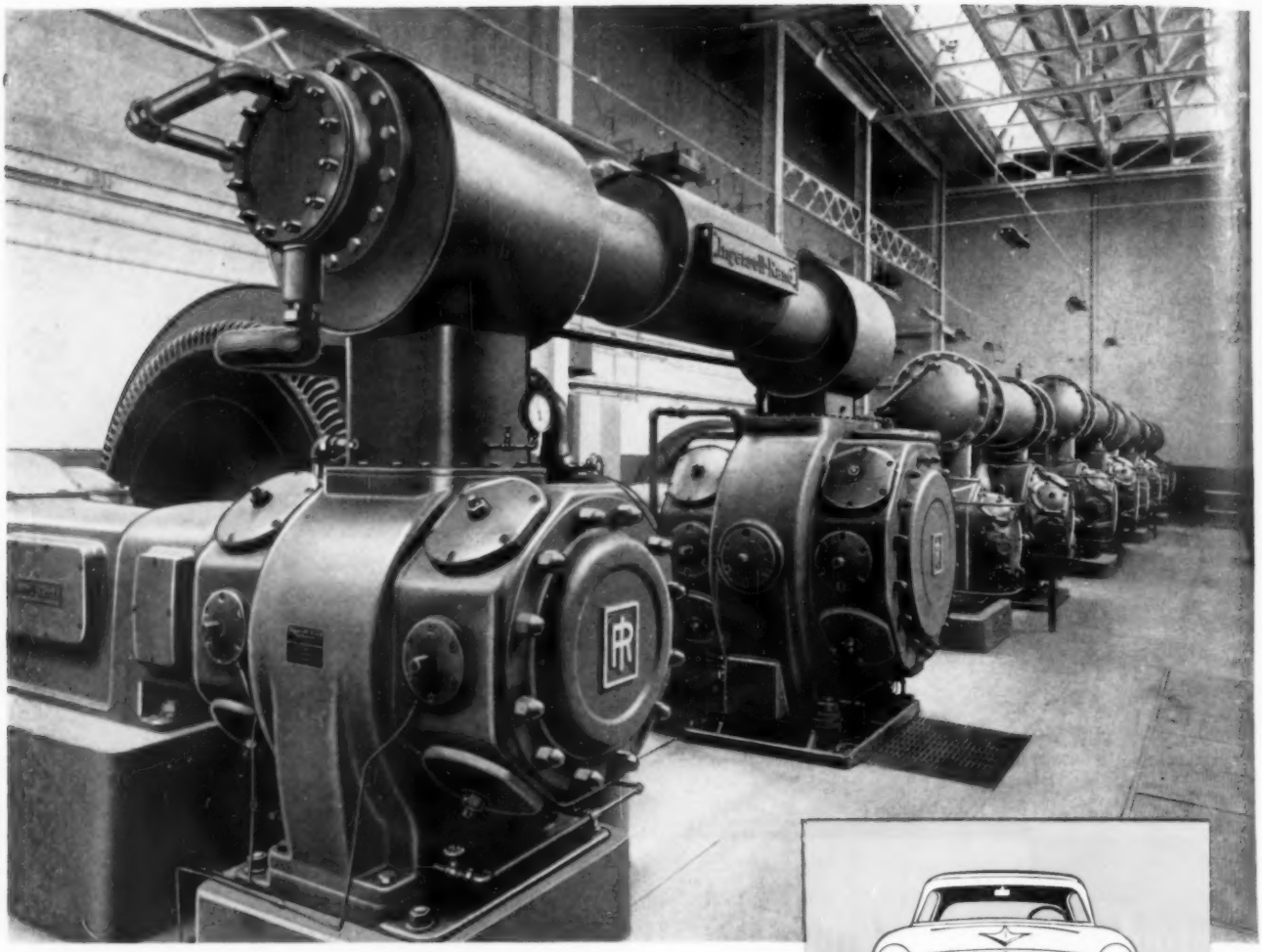
The secret lies in an "electronic brain" that checks the finished gears as they come from the hobber and makes corrections as necessary in pitch diameters or root fillets by electrically shifting the hob between cycles.

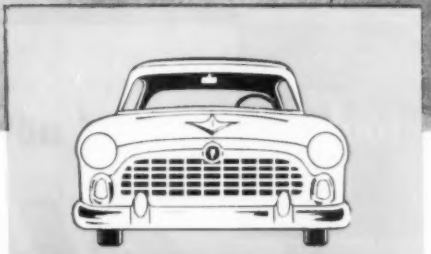
This is truly a revolutionary step forward in gear hobbing efficiency . . . time-saving as well as money saving.

If you, too, want to stop manufacturing "scrap" in your hobbing operations by catching off-tolerance pieces *before* they're hobbed, get the whole story from your Lees-Bradner representative. Or, write to us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO • U.S.A.





Streamlined Air Power Plant

behind the streamlined NEW HUDSON

Modernized compressor room at Hudson Division of American Motors simplifies operation and maintenance

AT Hudson, improvement of plant and product go hand-in-hand.

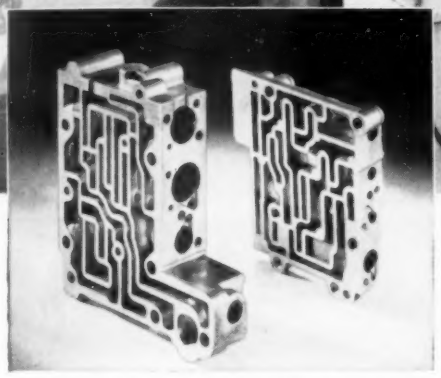
Here, the compressed air plant previously consisted of one steam- and four electric-driven compressors, in three different locations. The old steam-driven unit, which had out-lived its value as a dependable standby, was replaced by a new Ingersoll-Rand 3,000 cfm PRE compressor. All five electric-driven compressors were then installed in a single building, with receivers and aftercoolers in the basement directly below. This compact installation is shown above, with the new PRE unit in the foreground. The four other compressors are also Ingersoll-Rand PRE units. Although more than 25 years old, they were found to be in such excellent running condition throughout that there was no need for replacement.

Wherever you need thoroughly dependable, low-cost air power, it pays to specify Ingersoll-Rand. Your I-R representative will be glad to show you why—and give you full details on any type of air or gas compressor. Helping you is his business!

Ingersoll-Rand

1–260 11 Broadway, New York 4, N. Y.

COMPRESSORS • CONDENSERS • AIR & ELECTRIC TOOLS • PUMPS • ROCK DRILLS • GAS & DIESEL ENGINES



Holes on extremely close centers vary in diameter from 1/16" to 13/16". The valve body has 33; the cover, 18.

"—BUT OUR PRODUCTION RUN IS LIMITED."

"SO WAS THE RUN ON THIS AUTOMATIC TRANSMISSION PART, BUT". . . .

HERE'S HOW ZAGAR TOOLING SAVED MONEY HAND OVER FIST

This aluminum die casting is processed in its entirety by Zagar planning, except for milling two faces. Two lines of Zagar standardized self-clamping drill jigs ream, tap and drill both valve body and cover. With 24 heads and 24 fixtures, Zagar performs work on 51 holes on close centers. Step tools take care of reaming and burnishing. The fixtures were designed to compensate for slight inaccuracies in the die casting. Thus has Zagar engineering solved an acute problem of limited production without the purchase of costly special machines.

Ask on your letterhead for Bulletin "E-11."

ZAGAR TOOL, INC.

24000 LAKELAND BOULEVARD • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

A New Concept in Optical Comparator Design...

new WILDER small parts Comparator
model C

- *Vertical Design*
- *Erect Image*
- *Eye Level Screen*
- *Horizontal Stage*

An Entirely New Model Optical Comparator
Designed for 100% Production Inspection
ACCURATE - FAST - INEXPENSIVE
Promotes Inspection Economy

If you manufacture mass produced parts that are now being inspected or should be inspected on an Optical Comparator, the new Small Parts Comparator will enable you to inspect them quickly, accurately and economically at a surprisingly low per-piece inspection cost.

Write for Illustrated Folder—Code GINZE

Geo. SCHERR OPTICAL TOOLS, Inc.

200-TE LAFAYETTE STREET • NEW YORK 12, N. Y.

USE READER SERVICE CARD; INDICATE A-11-274-1

is no problem!

...what's more, Lovejoy is set to give good delivery. Lovejoy's large engineering staff and modern plant offer every facility for production of any size standard or special milling cutter. Our 35 years' experience can help you get the best results, economically, on all milling operations. And, no matter what the age of your Lovejoy housings, blades of H.S.S., alloy and carbide are promptly available from stock!

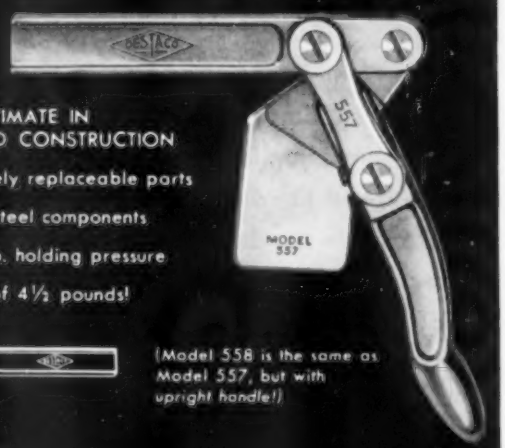
Free—3 new Lovejoy catalogs: *Arbors, Face Mills, Side Mills.* Also the Lovejoy *Speed and Feed Calculator.* Write today!

LOVEJOY
TOOL COMPANY, INC.

USE READER SERVICE CARD; INDICATE A-11-274-3

announcing 2 NEW

DE-STA-CO **TITAN TOGGLE CLAMPS!**
(Models 557 and 558)



- THE ULTIMATE IN RUGGED CONSTRUCTION
- completely replaceable parts
- forged steel components
- 4,000-lb. holding pressure
- weight of 4½ pounds!

(Model 558 is the same as Model 557, but with *upright handle!*)

Send for **FREE Literature** on these new DE-STA-CO Titans—Models 557, 558!

DE-STA-CO **DETROIT STAMPING COMPANY**
WORLD'S FIRST LINE OF TOGGLE CLAMPS
328 **Midland Avenue • Detroit 3, Michigan**

USE READER SERVICE CARD; INDICATE A-11-274-2

Get More Tool and Cutter Grinding Capacity at Lower Cost with...

the *NEW* STERLING Model "RK-2"

All types of cutting tools from single point lathe tools to 22" diameter saws can be ground quickly and accurately on this completely NEW Tool & Cutter Grinder.

Eliminating heavy, expensive anti-friction tables provides greater stability, better accuracy and increased capacity at LOWER COST.

The compact design puts all controls in easy reach of the operator—set-ups take less time . . . the floating spindle moves so easily that operator fatigue is cut to a minimum. Standard equipment includes centers with 11" swing, and 14" between centers.

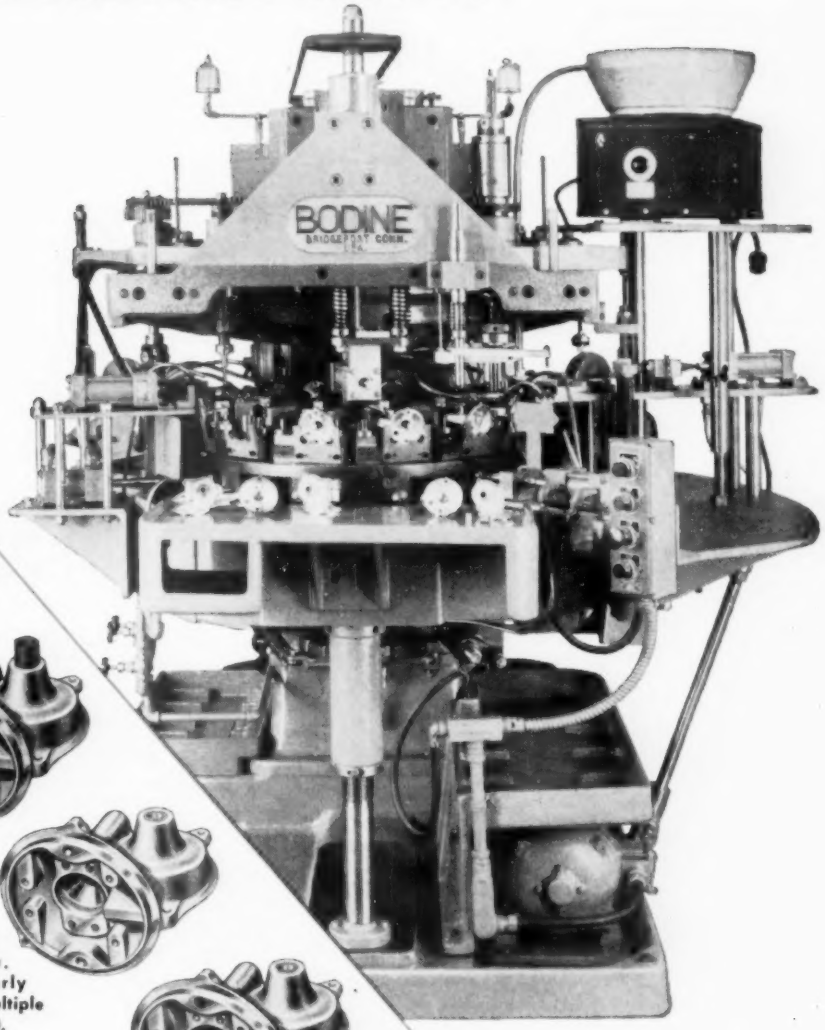
You get more capacity for grinding tools and cutters at about ½ the cost of a Universal Tool & Cutter Grinder with the NEW Sterling Model "RK-2".

Write TODAY for illustrated bulletin RK-2.

McDONOUGH MFG. CO.
1517 Galloway • Eau Claire, Wisc.

USE READER SERVICE CARD; INDICATE A-11-274-4

Bodine CASE HISTORY NO. 37

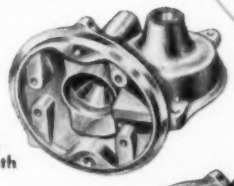


1 Hand-load part to clamping fixture.

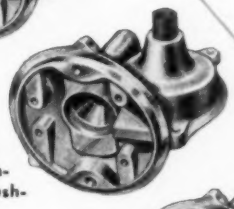
2 Automatically position locking lever.

3 Inspect for part and proper positioning in fixture.

4 Automatically clamp.



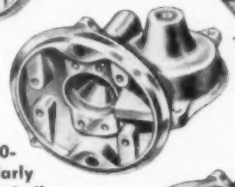
5 Spot face ⅜" dia. maintaining depth to ± .002".



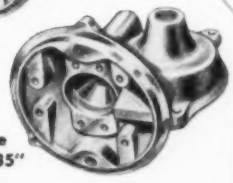
6 Automatically hopper feed, transfer and insert Oilite bushing.

PROCESSING WINDSHIELD WIPER MOTOR HOUSINGS

7 Drill 4 - #31 dia. (.120") holes and 1 - .1235" dia. hole (angularly mounted multiple drill head).



8 Tap 2 holes #10-32 with angularly mounted 2-spindle tap head.



9 Size I.D. of Oilite bushing to .3735" - .3745" dia.

10 Automatically unlock and retract locking lever.

11 Hand-unload.

PRODUCTION

One piece per stroke . . . 20 strokes per min. — 1000 pieces per 50-min. hour. 10,000 individual operations per 50-min. hour.

MATERIAL

S.A.E. #925 Die Casting (Parts No. EMG-2, EMG-3, right- and left-hand).

TOLERANCES

(Other than specified above) Drilled holes: Size .001". Location: ± .002". Tapped holes: Class 2 threads.

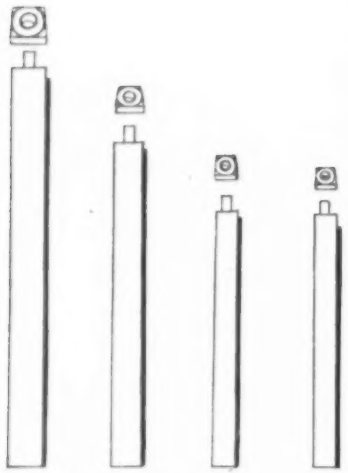
MACHINE

Bodine Model 42-30 Drilling, Tapping, Assembling Machine. Write us for Bodine Brochure TE-11, "12 Case Histories."

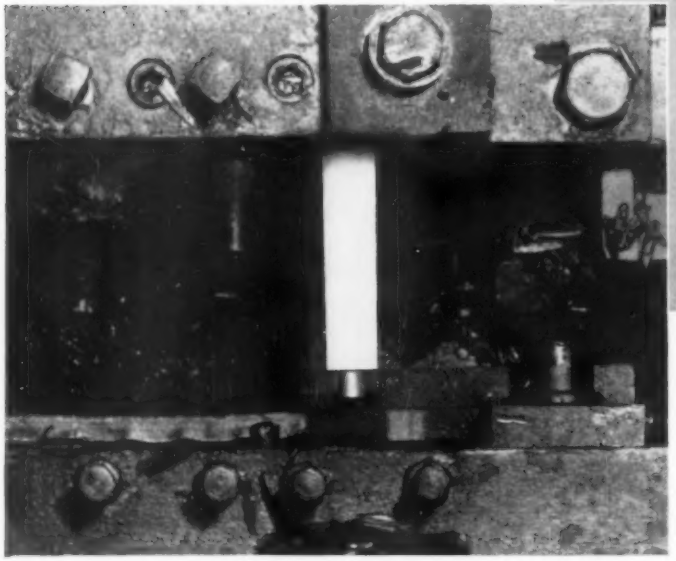
"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



A-L CUSTOMER FINDS SAGAMORE PUNCHES BEST IN TOOL-COST STUDY



Looking down on the SAGAMORE high speed cold nut punch in horizontal press.

An A-L customer tested various tool steels to determine the best for his varied cold-punching operations. New, air-hardening, non-deforming Ludlum Sagamore Die Steel was the ultimate choice. Here's why:

- The use of SAGAMORE cold-drawn stock eliminated the need for finish-grinding of the punches.
- Punches of SAGAMORE outperformed those of carbon-vanadium steel three to one.

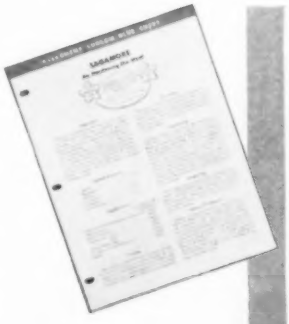
The SAGAMORE punches were hardened by heating in a salt bath to 1750F. and air cooled. They were then given a double draw at 1110F. The resulting Rockwell hardness was 51C.

Characteristics of Ludlum SAGAMORE are: Excellent non-deforming properties, unusual toughness, lower hardening temperatures, and easier machining and grinding. These, plus the comparatively low cost, make it a good selection for this type of application.

For assistance with your tool or die steel problems, call your local A-L representative or distributor today, or write ***Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.***

Write for your SAGAMORE BLUE SHEET

This four page report was compiled from data collected in laboratory and field tests. Included is complete information on applications, physical characteristics, forging, annealing, hardening, tempering, etc. *Ask for your copy.*



Address Dept. TE-71

For complete **MODERN** Tooling, call

Allegheny Ludlum

WBD 5328

AL FINE TOOL STEELS SINCE 1854

PARKER • MAJESTIC **pm** PRECISION MACHINES

SEMI-AUTOMATIC INTERNAL GRINDER

Accurate automatic sizing for production or semi-production.
Cam actuated spindle infeed.
Micrometer type wheel dresser facilitates size control.
Models available in 12″ or 24″ table travel.

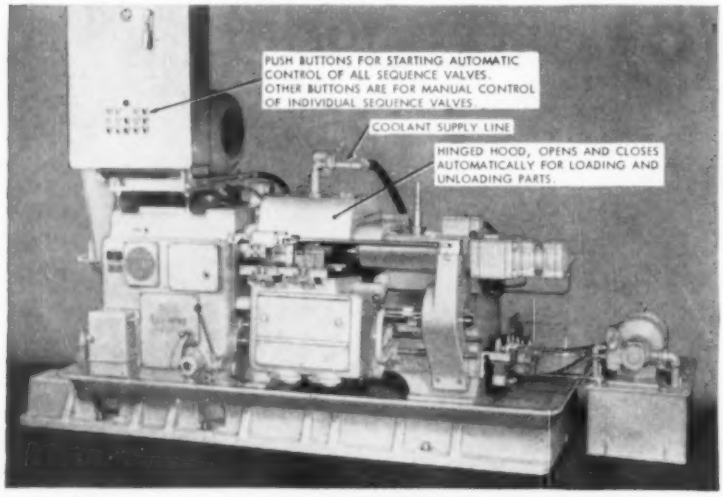
DESCRIPTIVE LITERATURE ON REQUEST

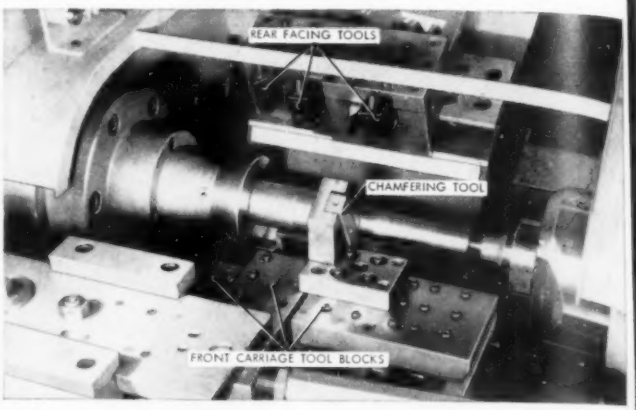
PARKER-MAJESTIC, Inc.
147 JOS. CAMPAU, DETROIT 7, MICH.

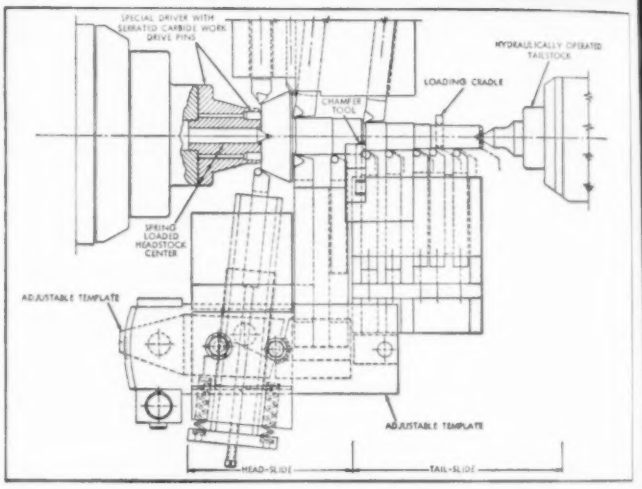
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK

Hinged hood in open position for loading and unloading parts ▶


PUSH BUTTONS FOR STARTING AUTOMATIC CONTROL OF ALL SEQUENCE VALVES. OTHER BUTTONS ARE FOR MANUAL CONTROL OF INDIVIDUAL SEQUENCE VALVES.
COOLANT SUPPLY LINE
HINGED HOOD, OPENS AND CLOSES AUTOMATICALLY FOR LOADING AND UNLOADING PARTS.





Lo-swing LATHE CUTS MACHINING AND HANDLING TIME ON REAR AXLE DRIVE PINIONS

PROBLEM: To finish turn (from end to end) Rear Axle Drive Pinions in one operation and to reduce handling time to a strict minimum.

SOLUTION: A Model AR Automatic Lo-swing Lathe, equipped with Automatic Controls and Serrated Pin Type Driver was selected for this job. The work piece is driven from the gear end by a special driver fitted with serrated carbide pins which indent the large face of the gear. Indentation is obtained by pressure from the tailstock center which is mounted in a hydraulically operated quill. Two pressures, automatically controlled, are used...a high pressure for forming the indent while the shaft is being loaded between centers and a low pressure during the actual machining operation.

This method of driving the work piece permits the machining of all of the gear and stem diameters as well as the facing and undercutting of shoulders in a single operation. Eight carbide front turning tools, one of which is template operated, reduces the length of cut to 2-3/16". This is the length of cut required for the bearing nearest to the bevel gear. The facing, undercutting and chamfering of shoulders are accomplished with four carbide tools mounted on the rear slide. It should be noted that the template is adjustable to handle bevel gears having different angles.

Handling time and operator fatigue are held to a strict minimum by the use of a loading cradle and automatic controls for placing the part between centers and opening and closing the hinged hood.

The machine stops at the end of the cycle with the spindle stopped, tailstock center retracted, hinged hood open and with the machined part dropped into the cradle. The operator simply replaces the finished part with a rough forging and then pushes two starting buttons, energizing the loader controls, which consecutively close the hood, place the work between centers, indent for the driver pins and finally start spindle rotation. The automatic cycle from then on is controlled by the automatic camming built into the base machine.

The tooling area of the machine is entirely enclosed to protect the operator from flying chips and coolant while cutting at high spindle speeds. Two starting buttons, wired in series, require the operator to use both hands. They are so located that the operator is out of range of the closing hood, thereby preventing accidents.

Control buttons on the door of the starter panel permit normal operation of individual controls and are convenient for setting up and timing loader movements.

Seneca Falls engineering staff is at your disposal to help solve your production problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

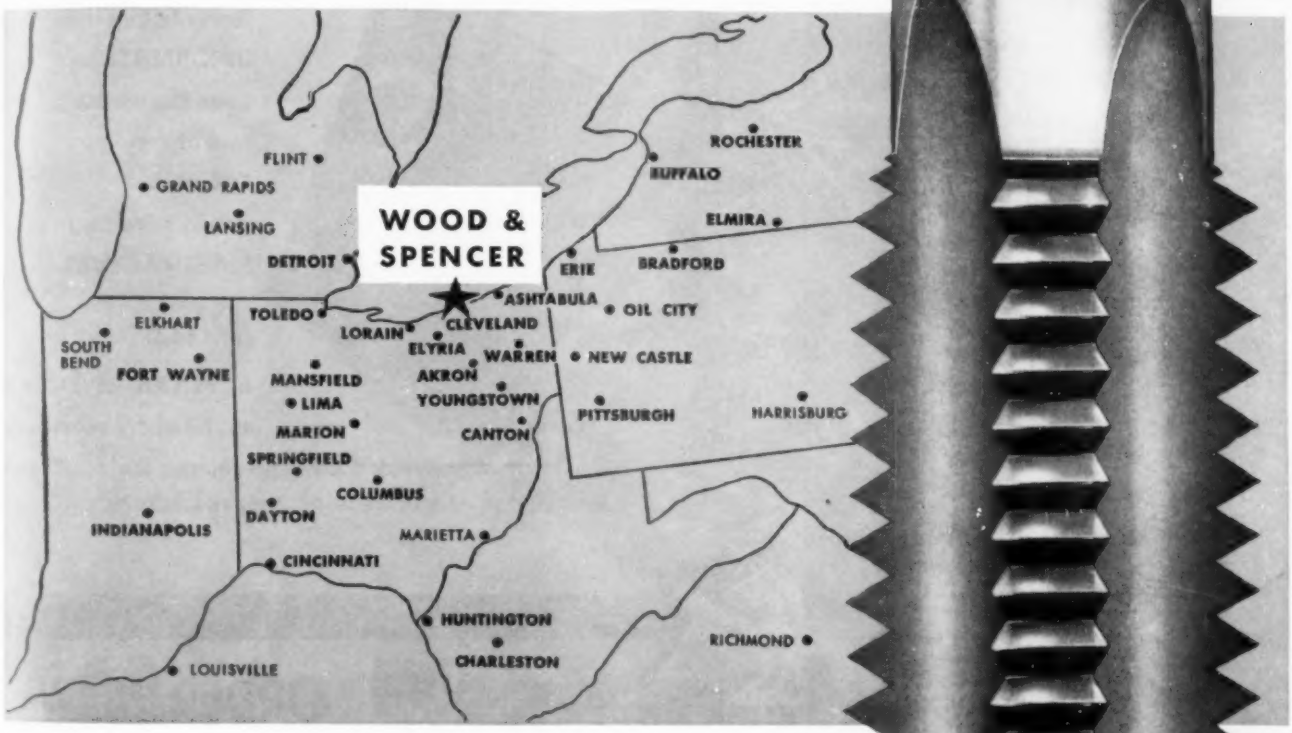
PRODUCTION COSTS ARE LOWER WITH Lo-swing

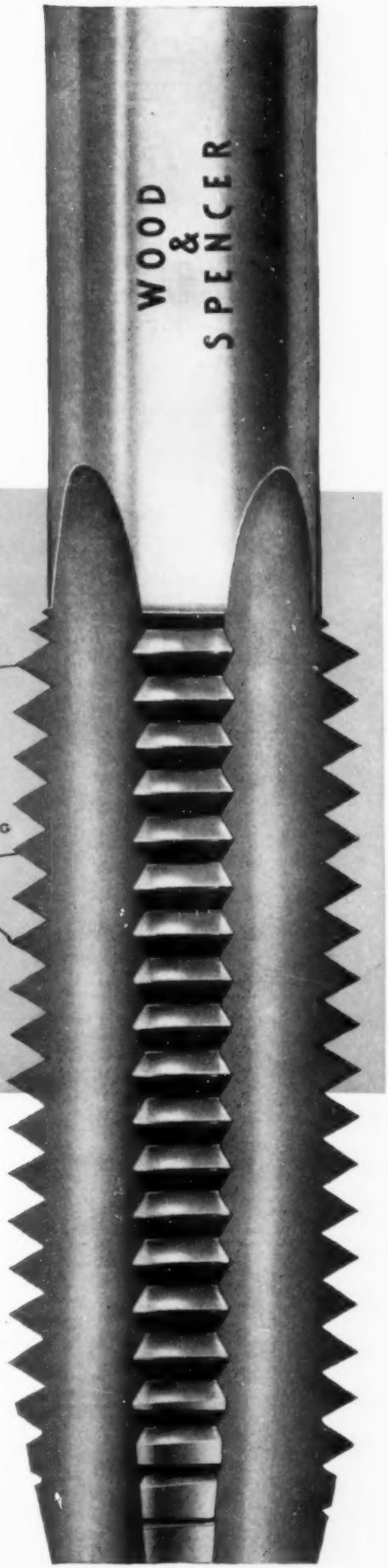
Wood & Spencer

STANDARD **TAPS** SPECIAL

Fast Local Service

...in the heart of the metalworking industry





We have gained an outstanding reputation for fast delivery on "specials". And we make immediate shipment from our complete stocks of standard taps.

In addition to *speed* in handling tap orders, we also offer technical assistance when you need it.

Try this service. We think you'll find it a great help when it comes to buying taps or overcoming tapping problems. Remember, telephone orders get immediate attention.

Want a free tap guide! Everyone who has one finds this handy wall chart an excellent ready-reference. It tells all standard gage tolerances, class fits and tap tolerances. Write us for one on your business letterhead.

The Wood & Spencer Company • Cleveland 3, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-279

★ *27 Sections* COVERING
DIE DESIGN and PRESSWORK

★ *50 Authors* Each a
Recognized Expert in his Field

30,000 members surveyed the most complete book of its kind—anywhere

752 Pages

632 Drawings

161 Useful Tables

PRESSWORKING TERMINOLOGY
STAMPINGS DESIGN
PROCESSWORK PLANNING FOR PRESSWORK TOOLING
SHEAR ACTION IN METAL CUTTING
CUTTING DIES
BENDING OF METALS
BENDING DIES
METAL MOVEMENT IN FORMING
FORMING DIES
DISPLACEMENT OF METAL IN DRAWING
DRAW DIES
DIES FOR LARGE AND IRREGULAR-SHAPED STAMPINGS
RUBBER PAD AND HYDRAULIC-ACTION DIES
COMPRESSION DIES
PROGRESSIVE DIES
COMPOUND AND COMBINATION DIES
MISCELLANEOUS DIES
DIE SETS AND COMPONENTS
FEEDING AND UNLOADING EQUIPMENT
DIE SETTING AND MAINTENANCE
PRESSWORKING LUBRICANTS
SAFETY IN PRESSWORKING
PRESS DATA
FERROUS DIE MATERIALS
NONFERROUS AND NONMETALLIC DIE MATERIALS
FERROUS STAMPING MATERIALS
NONFERROUS STAMPINGS MATERIALS

DIE DESIGN
HANDBOOK

Now Ready!

Never-before-available **INFORMATION** from the working files of nearly **100** of the nation's leading **MANUFACTURERS**

Plus

A **MASS** of **DATA** supplied by members, societies and associations representing the combined knowledge of hundreds of other manufacturers.

ONLY $9.75* **ORDER NOW**

**ASTE member price (if ordered from ASTE)*
NON-MEMBER PRICE $14.50

Please send the "Die Design Handbook" to the address below:
Payment enclosed in the amount of $..... Orders shipped to Canada will enter the country duty and tax free. Remittance may be made in Canadian funds at the same prices. Shipments to other countries are subject to import regulations.

Name .....

Chapter (if member) .....

Business Title ..... Firm Name .....

Street Address .....

City ..... Zone .... State .....

Remittance payable to the Society must accompany order. Do not send currency. Mail this order coupon or a facsimile to: American Society of Tool Engineers, Dept. 3, 10700 Puritan Ave., Detroit 38, Mich.

OK series 3600
the BLACK ANGUS of face mills with . . .

More Beef in the Body

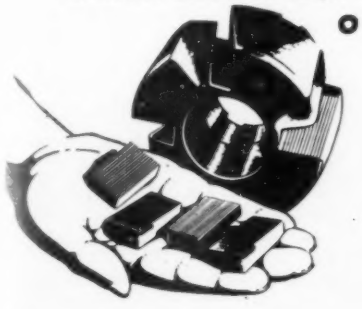
For the heaviest cuts that the biggest milling machines can pull.

OK Face Mills, size for size, have more weight, more substance, more beef in the body. And blades are huskier with a greater proportion of carbide available for cutting. It is a proven fact these cutters remove more metal in a given period than other cutters *which are complicated and weakened by recesses for screws, pins, gibs or locking devices.*

OK cutters consist of just two components — the body and the blades. Blades are simple wedge-shaped blocks, serrated on one face with matching serrations in the body. They are solidly seated by a driving fit, easily extracted with a drift, and stay put under the fastest speeds and heaviest feeds. The simple strength and ruggedness permit the placement of more blades in the fine pitch series and heavier blades in the coarse pitch series.*

You need the OK competitive advantages. Take your toughest job and let OK engineers have a go at it.

OK CUTTERS OUTPULL ALL OTHERS

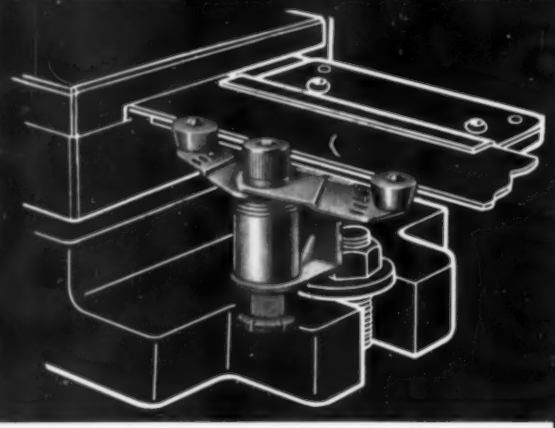


THE OK TOOL COMPANY, INC.
Milford, New Hampshire

***The wedge is the world's simplest and strongest basic mechanical device.**

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-281

NOW...
A Low-Cost Stock Guide



NEW DANLY ROLLER STOCK GUIDES AND GUIDE RAILS

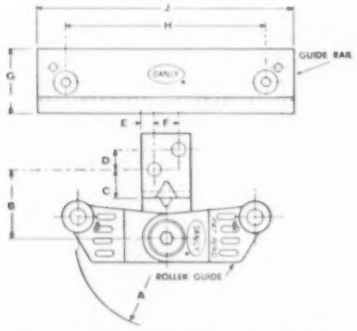
READY MADE—QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost...the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rugged...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....$3.50 box of five (all one size)
(Discount for quantity orders)



Roller Guide Dimensions, Inches

	Cat. No.	A	B	C	D	E	F
Roller Guide Large	9-70-6	2 3/64	1 15/32	5/8	1/4	5/16	7/16
Roller Guide Small	9-60-6	1 27/64	1 1/16	7/16	5/16	3/16	3/8

Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

Guide Rail Dimensions, Inches

	Cat. No.	Max. Stock Thickness	G	H	J
Guide Rail	9-8025-6	.025	1	3 1/8	4
	9-8045-6	.045	1	3 1/8	4
	9-8080-6	.080	1	3 1/8	4
	9-8125-6	.125	1	3 1/8	4

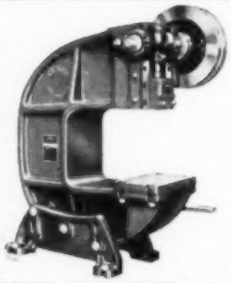
Danly Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify catalog number and mail orders to

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

USE READER SERVICE CARD; INDICATE A-11-282-1

KENCO
1½ to 15 ton
PUNCH PRESSES
...dependable



You get precision punching and high volume *consistently* with a Kenco press. It's built to eliminate downtime — with long-wearing parts and trouble-free assemblies. Needs adjustments seldom . . . replacements practically never. Write for literature.

KENCO MANUFACTURING CO.
Mfrs. of Precision Machinery and Accessories
5211-C Telegraph Road • Los Angeles 22, California

Extra long ram ways permit full use of guiding area to insure precision punching.

High strength castings used on clutch collar (illustrated), frame and ram ways — for extra rigidity and wear.

USE READER SERVICE CARD; INDICATE A-11-282-2

For A New TWIST In Production Stud Setting And Pulling . . . USE TITAN TOOLS!

Automatic Self-Opening Stud Driver — 100 Series Collapsible Type Trip Gage!

Automatic take-up or wear on jaws. Affords accurate maintenance of projection heights. Inexpensive method of clutch renewal gives double wear at half the cost.

"Presto" Magic Type QUICK CHANGE CHUCKS AND COLLETS

For both VERTICAL and HORIZONTAL applications. Just lift ring to insert or remove collets—without slowing spindle R. P. M. Famous TITAN concealed tension spring. No external snap rings to snag hands.

"Bull Dog" Stud Driver Designed for Use With Impact Wrenches

Built for rugged use on heavy engines. Equipped with Titan Design, Loose Pressure Plunger. Definitely stands up under vibration encountered when using an impact wrench for motive power.

Titan "Roll Grip" Combination Stud Driver and Puller

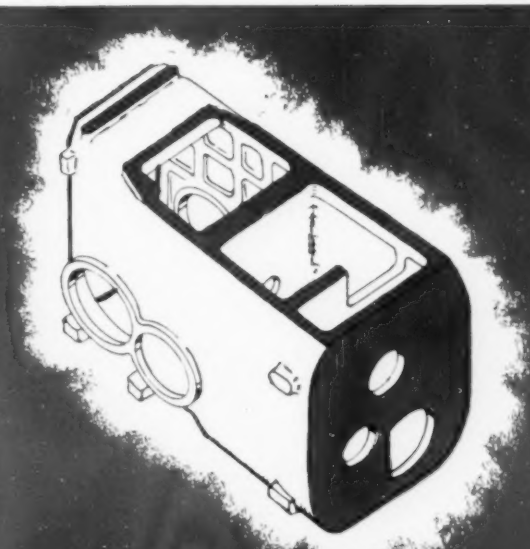
Incorporates roll action to grip as little as ½ in. of unthreaded body of stud. Made in standard sizes from 3/16 to 3 in. inclusive.

TITAN TOOLS
World's Largest Producers Of Stud Drivers And Pullers
TITAN TOOL CO.
44 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

USE READER SERVICE CARD; INDICATE A-11-282-3

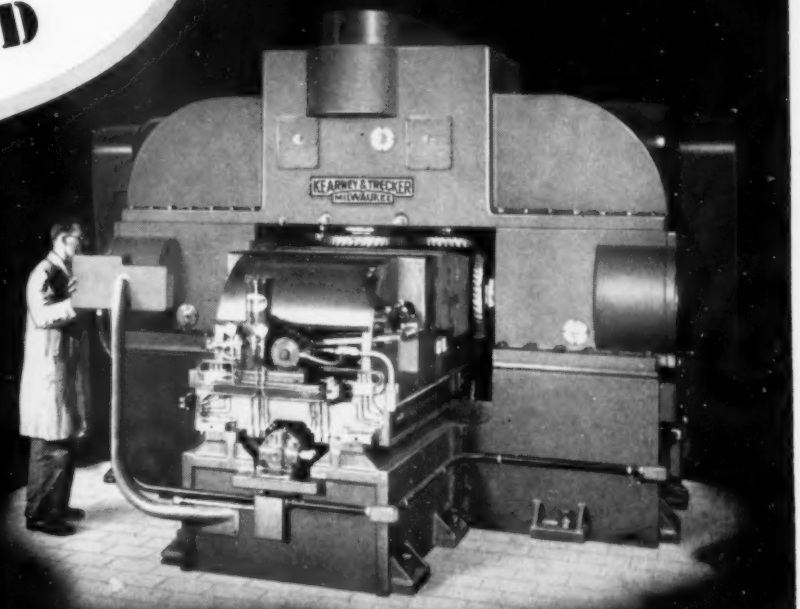
CUSTOMER SPECIFIED

One of the nation's famous-name farm machinery manufacturers required a big, high-speed, precision production milling machine which would mill several surfaces on huge, 625-lb. transmission case castings in a single setup.



Green indicates machined surfaces on tractor transmission case.

KEARNEY & TRECKER MILWAUKEE DESIGNED



Kearney & Trecker's proposal was accepted and the result was this 44-ton, Five-Spindle Triplex machine which mills top, front and rear surfaces of tractor transmission cases at a rate of 23 pieces per hour.

Two horizontal spindles are mounted in duplex fashion and three vertical spindles on the massive bridge type head. Horizontal spindles, driven by 40-hp motors, carry 22" dia. cutters with 44 blades. Powered by a 50-hp motor, two of the vertical spindles have 22" dia. cutters and the third spindle a 6" dia. cutter with 12 tungsten-carbide blades.

New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

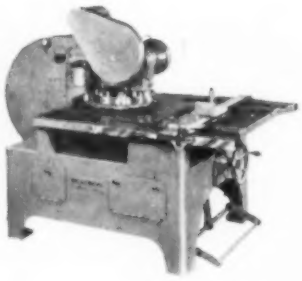
With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1062. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.

Builders of Precision and Production Machine Tools Since 1898

Send Drawings of Your Work to WIEDEMANN

for a FREE Time Study



From the small hand operated R-2 to the 150 ton Turret Punch Press, there's a Wiedemann designed for your short run piercing needs.

Learn how you can save 60% to 90% on piercing steel sheet or plate in small to semi-production lots with a Wiedemann Turret Punch Press . . . and these cost saving facts are based on drawings of your typical jobs. In addition, you will receive, without obligation, a recommendation for the most efficient, low cost tooling, and a detailed quotation on the Wiedemann best suited for your particular requirements.

This is not a new service. The cost reductions indicated by Wiedemann surveys have been selling these Turret Punch Presses for many years. It will pay you to get the facts about how a Wiedemann Turret Punch Press can pay for itself in two years or less through reduced piercing costs.

Send drawings of your work for a free time study and equipment recommendation or write for Bulletin 101 today.

WIEDEMANN MACHINE COMPANY

4245 Wissahickon Ave. P.O. Box 6794 Philadelphia 32, Pa.

Four Of A Kind For Better Barrel-Finishing. The new Norton Tumblex "T" abrasive brings you an unbeatable combination for top performance: non-wedging triangular shape; fast-cutting bonded ALUNDUM* abrasive; and four sizes for the widest range of applications.

Brand new! . . . Norton TUMBLEX "T" – bonded, triangular shape tumbling abrasive

Users report Tumblex "T" abrasive brings many new "TOUCH of GOLD" benefits to barrel-finishing

Here's one of the most revolutionary barrel-finishing innovations ever developed. In typical on-the-job tests, Norton customers report that the new Tumblex "T" tumbling abrasive:

"cuts tumbling cycle time from five hours to one hour."

"finishes steel and magnesium parts that could never before be barrel-finished."

"completely removes burrs from stainless steel parts in four hours. Abrasives previously used failed to do so in 12 hours."

Everything about Tumblex "T" abrasive is designed for better barrel-finishing.

Its uniform triangular shape and size prevents wedging in recesses of parts.

Made of famous Norton ALUNDUM abrasive, it cuts fast, with no compound needed — resulting in shorter time cycles and lower costs per piece finished.

It provides maximum surface contact with parts being processed, assuring top quality work in fastest time.

It wears down evenly, keeping the same triangular shape. No small chips to lodge in holes, slots, etc. — and when worn down it can be used on parts requiring a smaller size abrasive.

Its lightness means less weight required to fill the barrel. Results are more uniform finish, without roll-in or roll-over of edges of parts.

Its chemical inertness, unaffected by acids, compounds or detergents, prevents spoilage common to other types of abrasive.

Send Your Work Samples

to our newly enlarged Sample Processing Department. Let us prove to you how the latest barrel-finishing equipment and techniques can improve your product quality and cut your finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-294

NORTON
ABRASIVES

Making better products... to make your products better

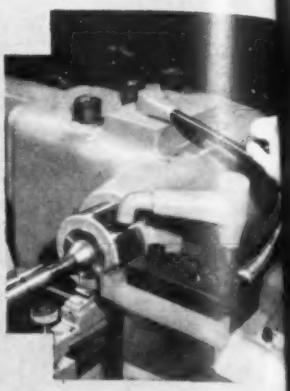
NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives Sharpening Stones • Pressure Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Try These PLUS Features for Production-Plus!

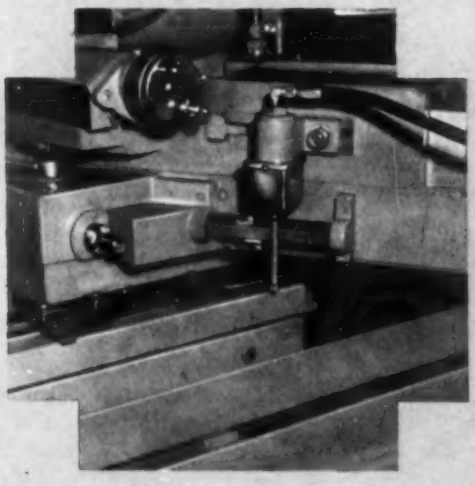
THE PROTECTED CONTROL CENTER, all-electric, is at the operator's fingertips. In addition to all conventional controls are a feed meter for all front and rear carriage feed settings; a work-drive motor horsepower meter.

SOMETHING NEW IN TAILSTOCKS. A single operating handle moves the air-operated anti-friction mounted tailstock spindle forward to center in the work. When center is firmly positioned, an interlock releases handle so that it can be pushed farther into second position which closes the air-actuated chuck jaws and clamps the tailstock spindle.



MULTI-CYCLE PROGRAMMER – This unit consists of a cam drum with a series of as many as 24 control cams. The drum is arranged in such a manner that it indexes 1/20th of a revolution at each actuation.

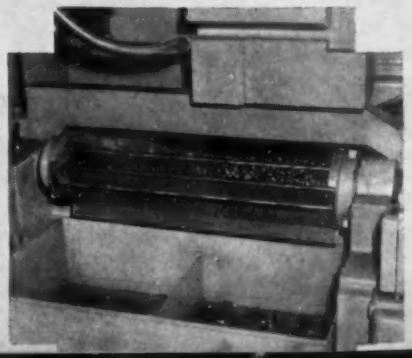
The cams control a series of switches which in turn causes changes of feeds, speeds, lengths of cut, pick up of rear slide and other phases of the operational cycle. Indexing of the cam drum is accomplished by means of signals from electrical contact switches on the apron which contact easily adjustable dogs mounted in six sections on a slotted plate behind a sliding panel on the front of the machine. Here's instant versatility—no limitation of cycles—no wiring changes.



The MULTI-CUT DEVICE provides for as many as four completely automatic passes of the tool over the work piece. The first two roughing passes are controlled by an air-actuated indexing stop unit working in conjunction with the "Air-Gage Tracer" stylus. The third semi-finish pass and fourth finish pass are template controlled. One template is stacked on the other with automatic indexing taking place as required during the cycle.

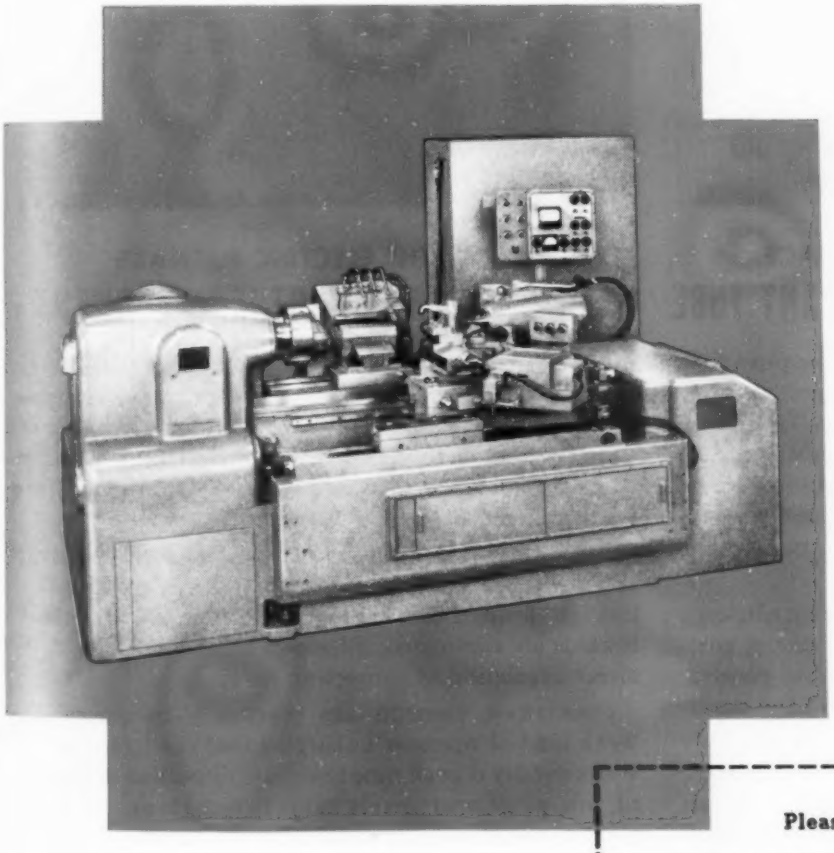
The Multi-Cut Device makes short work of jobs requiring heavy stock removal.

GOODBYE, MR. CHIP! Independently powered chip conveyor for removing chips from pan is optional. Conveyor can be used, if desired, to feed chips into a centralized chip disposal system.



See What We've added for the Latest in AUTOMATIC MULTI-CYCLE TURNING!

THE MONARCH MODEL 21 MONA-MATIC. Offered in 18″, 30″ and 42″ length between centers. The single running tool turns, bores and faces practically any combination of diameters, tapers, forms, undercuts, shoulders, radii and chamfers in a single continuous cut. Tools on the rear carriage may be timed to perform necking, grooving and forming cuts automatically in the desired coordination with the front carriage cycle.



Already, at first glance, many production men tell us this is IT! You're doubtless familiar with the production records rung up by the established Mona-Matics, with the famed Air-Gage Tracer controlled single running tool. And with the Air-Gage Tracer's reputation as the most accurate duplicating device known.

Now, we've gilded the lily. We've added the exclusive Monarch Multi-Cycle Programmer, the Multi-Cut device, greater metal removing capacity—and a host of other new developments besides!

Weigh the value of these new features added to the production-line-proved Mona-Matic principle. All these, plus such optional features as constant surface cutting speed and full automation, make the Model 21 the fastest producing lathe on any production line.

Don't you want—right now!—our illustrated booklet describing this new machine? Just clip the coupon to your letterhead . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

Please Clip This Coupon to your Letterhead

THE MONARCH MACHINE TOOL COMPANY,
Sidney, Ohio

Gentlemen:

☐ I would like to know more about your Model 21 Mona-Matic Lathes. Please send me without obligation your illustrated Booklet #1806 with complete information and specifications.

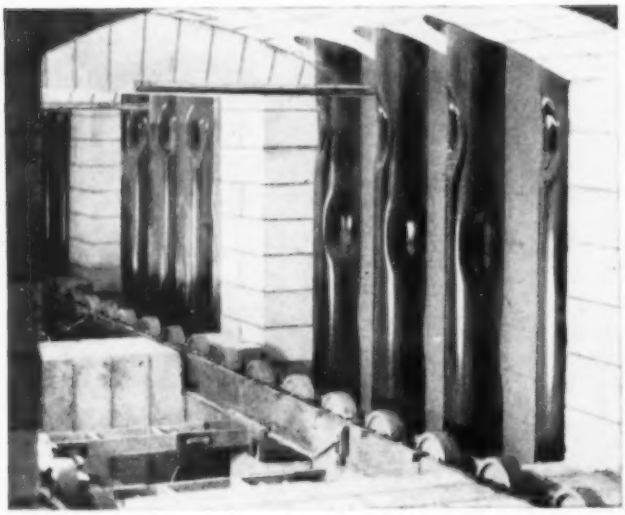
☐ Please have a Monarch sales engineer call on me.

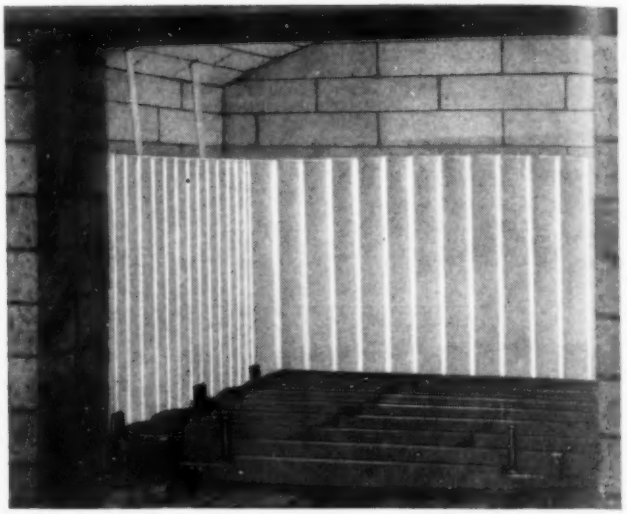
NAME_____

TITLE_____

Whatever your source of heat...

LINDBERG HEAT TREATING FURNACES OFFER THESE EXCLUSIVE ADVANTAGES





. . . IN THE GAS-FIRED FURNACE
NEW LINDBERG VERTICAL RADIANT TUBE

Because of its revolutionary design, this tube provides a new level of gas-fired furnace performance. The secret lies in the new Lindberg tube's "dimples." The tube carries a central stream of mixed air-and-gas surrounded by a cylindrical stream of air alone. Combustion occurs in the area between these two streams. The "dimples" create eddies accelerating combustion and maintaining even temperatures along the entire tube.

This Lindberg tube will operate at maximum efficiency for a longer period of time. The special protective coating gives greatest possible resistance to carbon penetration. Vertical position eliminates soot deposit and resultant temperature increases at points of sooting.

Tubes are 59 inches long, weigh only 29 pounds, changeable in a few minutes. No costly furnace shutdowns nor high labor and material cost for tube changes.

. . . IN THE ELECTRIC FURNACE
NEW LINDBERG CORRTHERM ELEMENT

CORRTHERM, Lindberg's radically advanced new electric heating element offers advantages never before available for heat treating furnaces. With this new element carburizing and carbonitriding with electricity becomes practical, efficient and economical. Ideal, too, in other types of Lindberg electric furnaces.

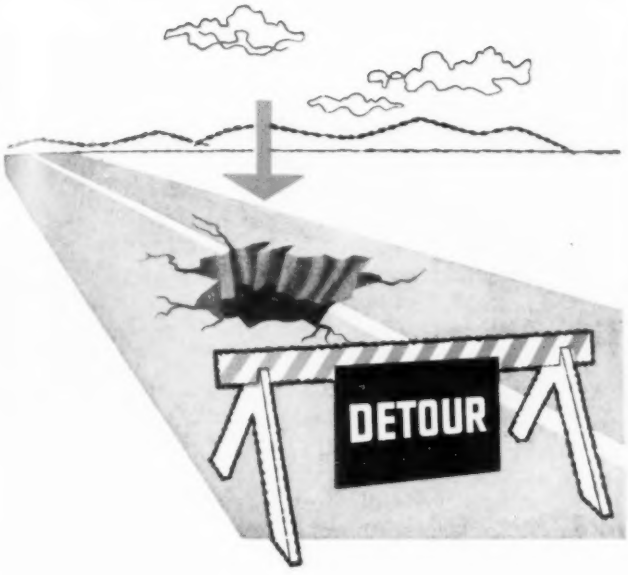
The outstanding feature of the CORRTHERM element is the extremely low voltage at which it operates. Consequently, leakage through carbon saturation and shock or short hazards are eliminated. Elements also act as baffles to direct circulation of convection streams.

CORRTHERM elements are practically indestructible. Work load or operator's charging tool can't hurt them. Watts density is at all time low. Easily installed or replaced, too, as element merely hangs in furnace and no complicated mountings are required.

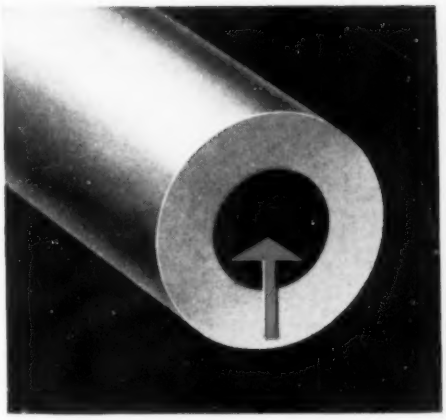
Lindberg Field representatives in 21 cities are ready to show you how Lindberg furnaces with these revolutionary new elements can improve your heat treating process. You'll find your Lindberg representative's name in the classified section of the phone book or write us direct

LINDBERG FURNACES

LINDBERG ENGINEERING COMPANY
2447 W. Hubbard Street ● Chicago 12, Illinois



a hole here wastes time...



a hole here saves time

Crucible Hollow Tool Steel Bars save time — and money too — whenever you need ring-shaped steel parts, or tools with a center hole. The tool steel is drilled through when you get it! You don't need to bore, drill, hole-saw, cut off or rough-face. That's why they cut your production time, increase machine capacity — and reduce scrap losses.

You can get these hollow bars in any of Crucible's famous quality tool steels, in almost any combination of OD and ID sizes. And you can get *immediate* delivery of five popular grades — KETOS oil-hardening; SANDERSON water-hardening; AIRDI 150 high carbon, high chromium; AIRKOOL air-hardening; and NU DIE V hot-work tool steels — from the Crucible warehouse near you.

Call your Crucible representative for the full story of how these steels can save time and money in your shop. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

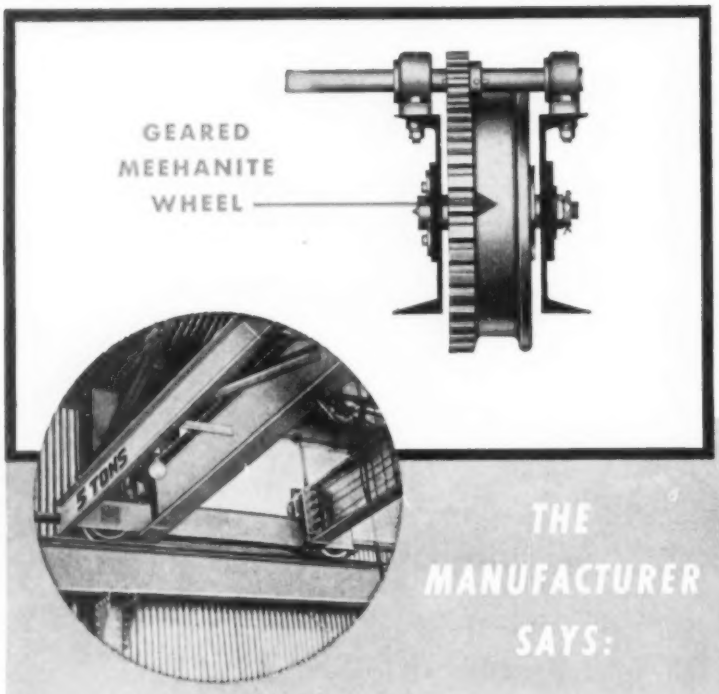
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-289

The MEEHANITE® Casting Report

CRANE MANUFACTURER REPLACES CAST IRON WHEELS WITH MEEHANITE METAL®



One of the leading manufacturers of overhead travel cranes, crane runways, hoists, and trolleys, Lypta, Incorporated, Houston, Texas, has standardized on specifying Meehanite metal for all the crane and hoist travel wheels it manufactures.

In the search for better performance, the company found Meehanite cast and machined wheels to be better than those of cast iron or "car wheel iron" from the standpoint of strength, and better than steel because wheels made of Meehanite metal running on steel rails do not cause the noise made from the contact of steel wheels on steel rails.

THE MANUFACTURER SAYS:

"We have found that by using Meehanite metal for the traveling wheels on our cranes and trolleys, that we can furnish a wheel which will withstand seven times the impact of ordinary cast iron and has approximately the same tensile strength as steel. Meehanite castings machine better; do not wear the rails as fast because of their graphite content; and lend themselves readily to heat treatment and flame hardening."

CLAMPING PRESS USING MEEHANITE DIES MEETS EXACTING REQUIREMENTS

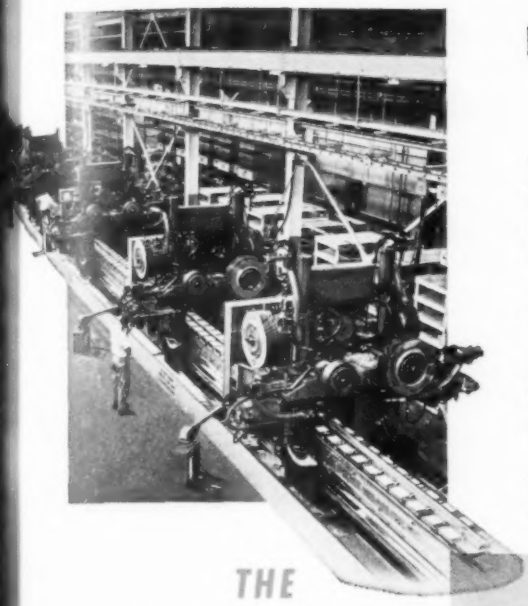
One of the operations involved in the making of exhaust systems for the Pratt & Whitney Aircraft Wasp Major engine at the plant of the Ryan Aeronautical Company, San Diego, California, is spot-tacking two large stainless steel half-stampings together with an arc welder. Savings in scrap loss, time and money were achieved by building special clamping presses which incorporated Meehanite dies.

As shown here, the welder using this clamping press inserts an arbor in the half-stampings, then brings the Meehanite dies down within contact thus being assured of an exact, close-fitting connection between the two half-stampings. The welder then arc-tacks the half-stampings together at the flange area.

THE MANUFACTURER SAYS:

"Meehanite metal was selected as the die material because it best meets the specific requirements for this work. Because the arc-tacking is performed very close to the dies, the localized application of heat would melt the lead or Kirksite alloys which are often used in such applications. Meehanite dies do not melt nor distort from the application of this localized heating, and are therefore excellent for these exacting requirements. Also, it is substantially more economical to use Meehanite dies rather than steel."

...dustries report what Meehanite Castings have done for them



FARNHAM "LONG MILL" REQUIRES 64 TONS OF MEEHANITE CASTINGS

The development of the Long Mill by the Farnham Manufacturing Division of the Wiesner-Rapp Co., Inc., Buffalo, New York, has revolutionized the milling of spar caps for the Navy planes at the Torrance Facility, El Segundo Division of Douglas Aircraft Co., Inc.

This mill, the largest of its kind in the world, is 308 ft. long and has eight integrated carriages which operate individually on the bed.

The sub-base or work-holder unit which is mounted on the basic bed was designed and fabricated in the Torrance plant. It is 288 ft. long and composed of 72 four-foot long Meehanite castings weighing a total of 64 tons.

After assembly on the machine bed, the 18-in. wide surface of the work-holder unit was machined to insure parallelism with the warp of the machine.

THE MANUFACTURER SAYS:

"Meehanite castings were specified for this Farnham Long Mill because the requirements called for castings of high tensile, non-deforming metal that had good machining characteristics and that would withstand shock loads without surface marring."

ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

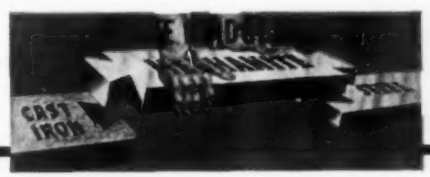
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
Blackmer Pump Company	Grand Rapids, Michigan
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio & Grove City, Pa.
Crawford & Doherty Foundry Co.	Portland, Oregon
DeLaval Steam Turbine Co.	Trenton, New Jersey
M. H. Detrick Co.	Newark, N. J. and Peoria, Ill.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Georgia Iron Works Co.	Augusta, Ga.
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Koehring Co.	Milwaukee, Wisconsin
Lincoln Foundry Corp.	Los Angeles, California
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Vulcan Foundry Company	Oakland, California
Washington Iron Works	Seattle, Washington
CANADA	
Hartley Foundry Division— London Concrete Machinery Co., Ltd.	Brantford, Ontario
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario

Write for your copy of **"The Handbook of Meehanite Metals"**

This Advertisement Sponsored by Foundries listed above

MEEHANITE METAL® CORP.

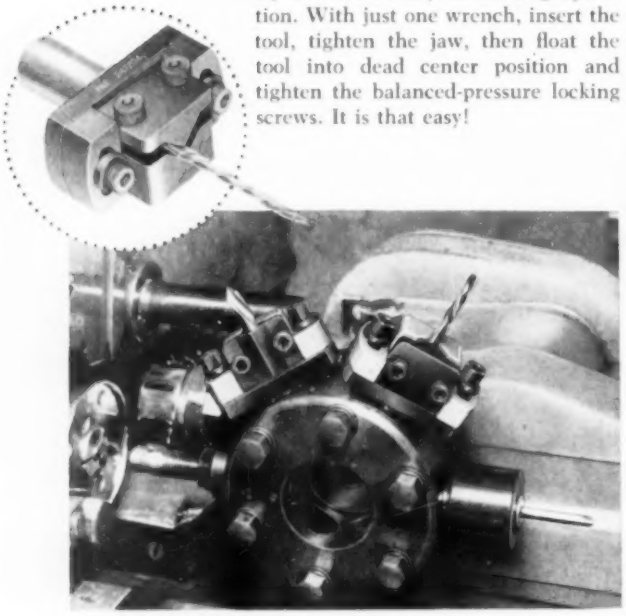
714 North Ave., New Rochelle, N. Y.



At **IBM** too...

New Brookfield tool holders cut set-up time, tool inventories

Precision ground V-jaw vises, Brookfield Tool Holders assure top-quality work every time! Without bushings or collets, drill, counterbore, reamer or cutter set ups can be made on the first try for almost any machining operation. With just one wrench, insert the tool, tighten the jaw, then float the tool into dead center position and tighten the balanced-pressure locking screws. It is that easy!



Brookfield floating drill holders being used in a Model OOG Brown and Sharpe automatic screw machine at IBM's Poughkeepsie, N. Y., plant.

Think... here is what production men at IBM's Poughkeepsie plant say:

"Brookfield Holders are being used in our Automatic and Hand Screw Machine Departments with considerable success and satisfaction."

"They hold a wide range of drill sizes in V jaws, with excellent alignment, producing a fine quality part. There is no alignment problem due to worn or distorted bushings or collets inasmuch as it is not necessary to keep bushings and collets in stock."

"Through the use of Brookfield holders there has been a definite reduction in set-up time, and the production of only top quality parts has been assured."

Patent No. 2472040

Write, Wire, Phone for Complete Information!

BROOKFIELD, INCORPORATED

STOUGHTON 112, MASSACHUSETTS

USE READER SERVICE CARD; INDICATE A-11-292-1

PERFECT MARKING

With the amazing Matthews "240" General Purpose Marking Machine, production marking of round, flat or contoured parts becomes a routine operation. Hydraulic-pneumatic power gives smooth, gentle, rolling action . . . or it can be used as a 6-ton stamping press.

Write for ... complete information

JAS. H. MATTHEWS & CO.

3943 FORBES ST., PITTSBURGH 13, PA.

BOSTON • PHILADELPHIA • CLIFTON, N. J. • CHICAGO

USE READER SERVICE CARD; INDICATE A-11-292-2

TO OBTAIN FURTHER INFORMATION ABOUT ADVERTSERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 171.

SIMONDS CROSS-ROLLED STEEL

Makes a Simonds hacksaw blade last longer!

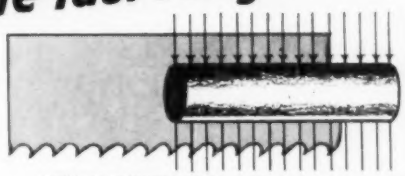
Look for... ask for the blade with the "RED END"

Test after test proves that Simonds "Red End" Hack Saw Blades last uniformly longer. One reason is Simonds *cross-rolled steel* . . . steel that has a more uniform grain structure for added toughness.

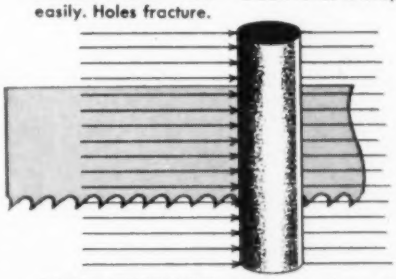
Another reason is Simonds own high quality steel — made especially for hack saw blade use.

Add to this Simonds improved method of tooth setting . . . and Simonds more uniform heat treating . . . and you've got the reasons why Simonds "Red End" Hack Saw Blades last longer, give more cuts per blade, cost less to operate.

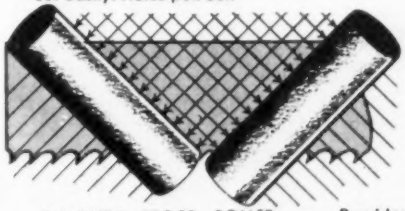
Furnished in all standard lengths and tooth sizes for hand and power use with a choice of High Speed MOLYBDENUM; High Speed TUNGSTEN; WELD-EDGE (High Speed Shatterproof); and STANDARD STEEL (Hand Blades only).



ROLLED WIDTH-WISE — Blade tends to snap easily. Holes fracture.



ROLLED LENGTHWISE — Teeth tend to strip out easily. Holes pull out.



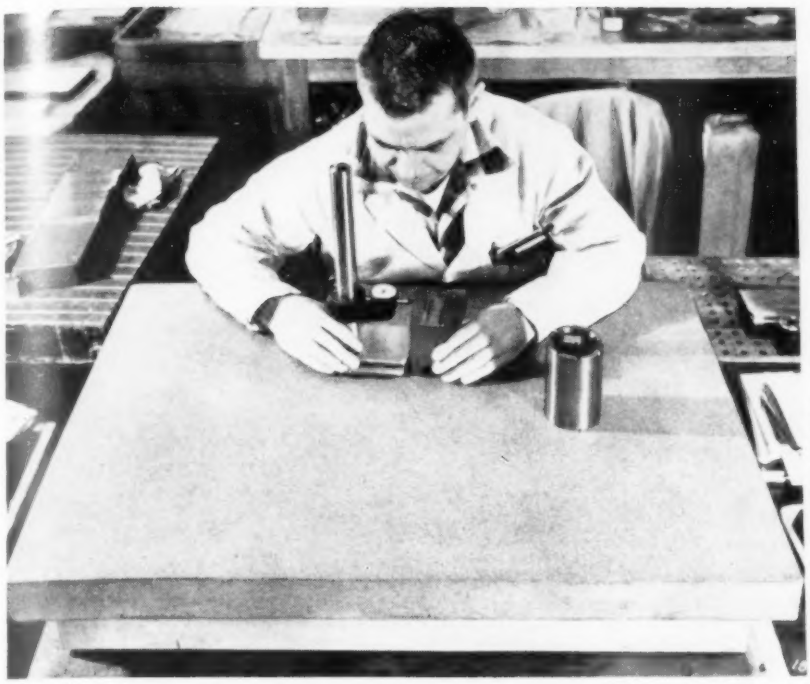
SIMONDS CROSS-ROLLED — Provides toughest grain structure for longest life and resistance to breakage.

For Fast Service from Complete Stocks
Call your
SIMONDS Industrial Supply DISTRIBUTOR

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

March 19-23
Coming!
8261 New Champions of TOOL-O-MATION*
The best and latest in *tools, machines, inspection equipment, automation devices, controls and accessories to cut costs and boost profits—many never before shown anywhere.
For the small plant
For the intermediate plant
For the big plant
See them at ASTE's Greatest Show
1956 ASTE INDUSTRIAL EXPOSITION
International Amphitheatre
CHICAGO, ILLINOIS
MARCH 19-23, 1956
Sponsored by the 32,000 men responsible for designing and selecting the best in production equipment. Write for advance registration blank today
Equally important, plan to attend the 5-day, all-industry conference covering the latest developments in manufacturing techniques and equipment.
AMERICAN SOCIETY OF TOOL ENGINEERS
10700 Puritan
Detroit 38, Michigan
ASTE



This 4-ledged Taft-Peirce Granite Surface Plate is made of high quality Blue-White Granite. Evenly distributed quartz and feldspar grains stand up under long, hard wear. The mica flakes are extremely fine. The plate is free from residual stresses and will not distort with temperature changes. T-P precision grinding and lapping produce the most accurate surface available to industry today.

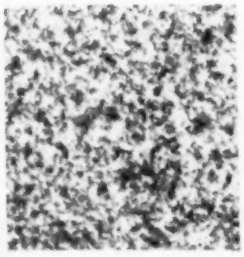
How to Select a Granite Surface Plate

More Tips from TAFT-PEIRCE on Toolroom Equipment

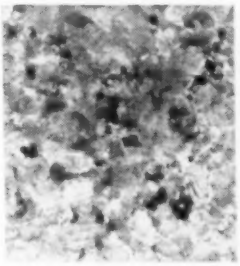
The word "Granite" is at best a vague specification for surface plates. There are many types of granite plates available, and not all are particularly well-suited for long and accurate service. Some granite surface plates wear less, chip less, maintain their accuracy longer than others. Fortunately it is easy to distinguish various kinds of granite by their surface appearance. The four unretouched photographs (enlarged to twice natural size) of several types of granite show what to look for when judging the quality of a granite surface plate.

Best quality granite is almost indestructible. Taft-Peirce Granite Surface Plates are made of very fine-grained Blue-White Granite. Heavy objects dropped on the surface barely powder the stone at *point* of impact.

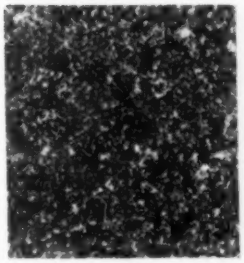
All Taft-Peirce Granite Surface Plates are carefully ground and lapped flat. More than 75 years of experience in making precision products assure maximum accuracy for layout and inspection work. For more information on Taft-Peirce Surface Plates, write for your free copy of the Taft-Peirce Handbook.



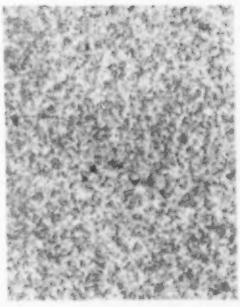
This photograph of gray granite shows the coarse distribution of quartz and feldspar grains, and the larger mica flakes. These clusters of mica wear rapidly and flake out, making larger pits and destroying surface accuracy.



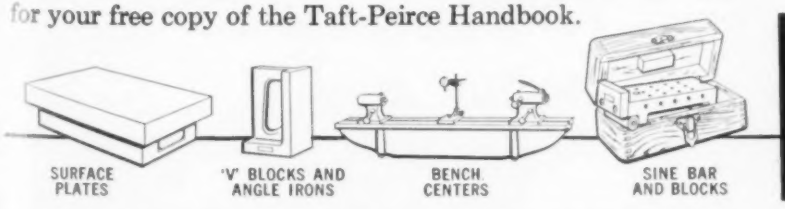
This pink granite has less mica and noticeably larger grains of quartz and feldspar, roughly scattered. Note the coarse, irregular texture of this granite.



Black diabase is composed chiefly of feldspar, hornblende, pyroxene, and black mica, with little or no quartz. These minerals are not quite as hard as quartz, and the mica, especially, flakes out with wear.



This photograph of a Taft-Peirce Granite Surface Plate shows the close, fine-grained texture of quartz and feldspars and the even distribution of extremely small mica particles. This Blue-White Granite from Westerly, R. I., will give long, accurate service.



T-P means Top Precision

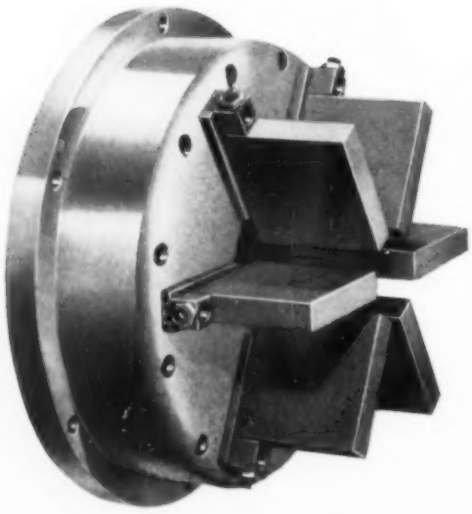
T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

NOW WOODWORTH *Standard* (AIR-OPERATED) DIAPHRAGM CHUCKS

3 SIZES 5½"-7"-10"

24-HOUR DELIVERY



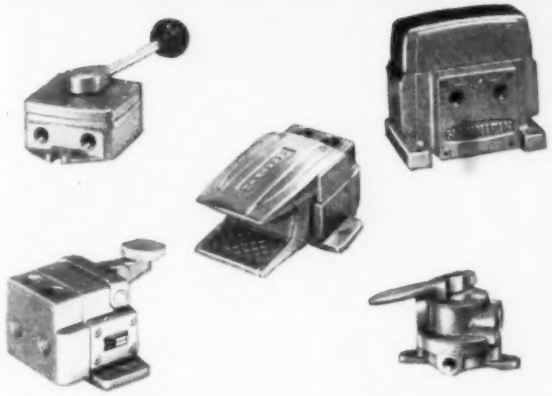
If you have a variety of simple chucking applications and want to be assured of the same top precision and fine quality ordinarily found only in Woodworth custom diaphragm chucks . . . order Woodworth "Standards" today! It's this easy: you simply bore the jaws to suit your part, make your own stop details and attach the air connection. Complete installation and operating instructions are furnished. Call your Woodworth representative or write for Woodworth Catalogue SC-56 for complete details.

WOODWORTH

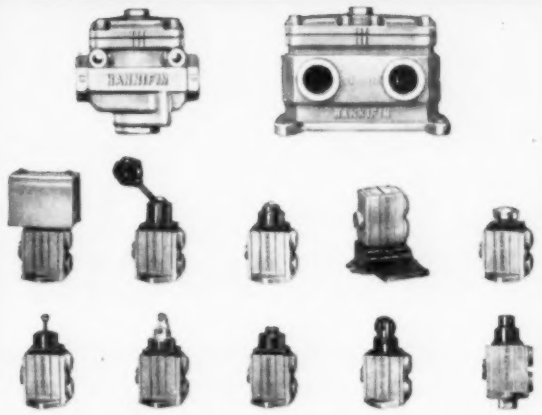
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • CONE-LOK JIGS • DIAPHRAGM CHUCKS AND ARBORS • PRECISION PARTS
PRECISION INVESTMENT CASTINGS • PRECISION HEAT TREATING OF AIRCRAFT PARTS

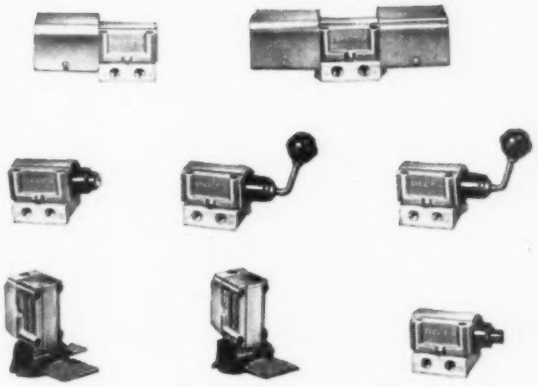
FOR AIR CYLINDER CONTROL... Manual or Electric



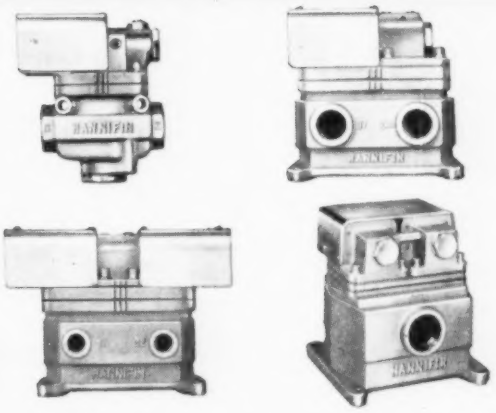
Hannifin Disc Valves. 3-way and 4-way, direct- or pilot-operated. For hand, foot or electric actuation.



Hannifin P-M Master Valves. 2-way, 3-way, 4-way. Remotely controlled from wide choice of Pilot Valves.



Hannifin P-M Direct-Operated 4-Way Valves. Small, compact, inexpensive. For every type operation.



Hannifin P-M Pilot-Master Valves. Solenoid controlled by integral pilot heads. 2-way, 3-way and 4-way.

HANNIFIN has the Air Control Valves for Your Specific Applications

Hannifin has the air control valves you need for use on your production lines or on the products you manufacture, often in a choice of types.

Shown here are typical valves from the extensive and complete Hannifin line. There's a Hannifin valve for every use from the simplest to the most complicated air-operated circuit. Singly or in combination, Hannifin valves provide hand, foot, cam, pressure or solenoid operation . . . in almost every pipe size.

You can simplify your air control valve problems by standardizing on Hannifin. Call in your Hannifin representative, who will discuss your valve requirements. Meanwhile, write for our complete Control Valves catalog.

WRITE FOR BULLETIN

Your copy of the complete Hannifin Control Valves catalog will be sent on request.

Stock Delivery on all types!

HANNIFIN

Hannifin Corporation, 519 S. Wolf Road, Des Plaines, Ill.

Air and Hydraulic Cylinders • Pneumatic and Hydraulic Presses • Riveters • Air Control Valves

Magnesium made it portable

Lightweight TOOLING PLATE builds advantages into portable fixtures . . . with important savings

THE DOW CHEMICAL COMPANY
Magnesium Sales Dept. MA 320N, Midland, Michigan

Please send the booklets checked below:

- ☐ Tooling plate brochure
- ☐ Booklet "Machining Magnesium"
- ☐ Booklet "Joining Magnesium"

Name _____

Title _____

Company _____

Address _____

City _____ State _____

There's a growing preference for magnesium tooling plate—and good reason, too! It's lighter in weight, easier to machine, and lower priced than most commonly used tooling materials.

The light weight of magnesium—⅔ the weight of aluminum, ¼ the weight of steel—permits ease of handling in portable jigs and fixtures for increased speed, safety and economy. Many other tooling uses benefit from magnesium's desirable properties.

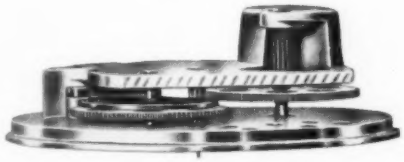
Magnesium plate in all sizes is rolled for greater accuracy. Dimensional stability, too, is assured by stress relief through oven flattening.

Get all the details from your Dow Magnesium distributor, or write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 320N.

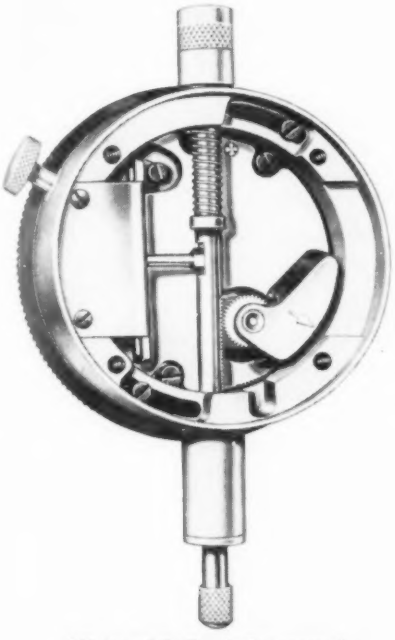
DISTRIBUTORS: COPPER AND BRASS SALES, INC., Detroit, Michigan • FULLERTON STEEL AND WIRE COMPANY, Chicago, Ill. • HUBBELL METALS INC., St. Louis, Mo. • A. R. PURDY CO., INC., Lyndhurst, N. J. • RELIANCE STEEL COMPANY, Los Angeles, Calif.

you can depend on DOW MAGNESIUM DOW

Front View



Side View



View with Back Removed
Showing Inside Mechanism

ONLY **Starrett** OFFERS YOU

THESE *NEW* FEATURES

in a Complete New Line of

HIGH PRECISION — LOW FRICTION

DIAL INDICATORS

(Patents Pending)

- SIMPLIFIED UNIT CONSTRUCTION with fewer parts for greater accuracy, longer life, easier maintenance.
- EASY READING DIALS cleanly designed for unobstructed vision with white egg-shell finish to minimize reflection, reduce eyestrain.
- NO GLARE Satin Chrome Finish on case with contrasting black bezel!
- EXTRA SMOOTH GEAR MOVEMENT with precision-cut involute gears and high efficiency, low friction gear train.
- REPLACEABLE BEARINGS low friction jeweled or inserted bronze bearings accurately aligned to eliminate end play.
- RUSTPROOF with *stainless steel gears,* pinions, racks and spindles.
- HEAVIER BRIDGE AND CASE to eliminate distortion, maintain lifetime accuracy.
- DIRECT ACTING SPRINGS completely around spindle or rack to eliminate cocking and side friction — gives smoother, more accurate action with less contact, pressure.
- COUNT HANDS on long range models read directly in decimals — no calculations.
- 4 SCREW HOLES permit rotating back 90° to use indicator in different positions.

THE L. S. STARRETT COMPANY 75th ANNIVERSARY 1880 1955 STARRETT TOOLS

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR Prompt delivery Dependable service Quality products

SEND THE COUPON TODAY for new catalog describing the complete new line of Starrett *High Precision — Low Friction* Dial Indicators.

The L. S. STARRETT COMPANY, Dept. E
Athol, Massachusetts

Please send information on Starrett *High Precision — Low Friction* Dial Indicators.

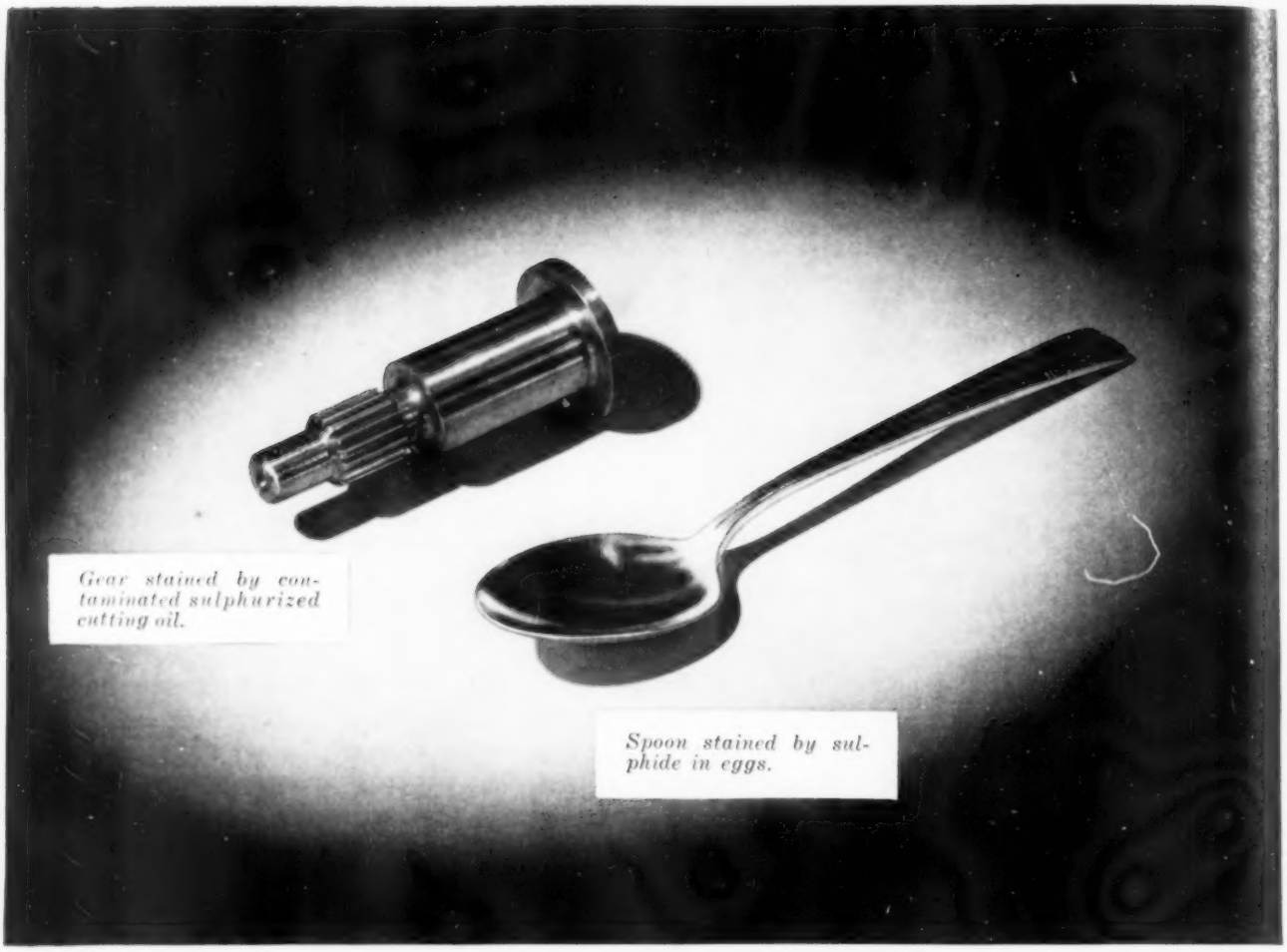
Name.....Title.....
Company.....
Street and Number.....
City.....Zone....State.....

Starrett®

"WORLD'S GREATEST TOOLMAKERS"

STARRETT TOOLS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES
PRECISION GROUND FLAT STOCK • HACKSAWS, BAND SAWS and BAND KNIVES
THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.



Gear stained by contaminated sulphurized cutting oil.

Spoon stained by sulphide in eggs.

Sulphur Staining on Ferrous Parts is Harmless

Staining of machined ferrous parts caused by cutting fluids containing active sulphur is similar to the stains you find on your silverware. It has no adverse effects whatsoever on the finish, or characteristics of the metal. *It is not corrosion*, and according to automotive and military authorities, in no way affects service life.

Experience has proved that cutting fluids containing active sulphur provide far better performance when machining the tougher steels. Staining can only occur during very humid conditions or when water is allowed to contaminate the sulphurized cutting oil. A sample piece of metal will not stain in a cutting fluid free of water . . . but often it will the moment moisture is added.

The *important* factors to consider when selecting a cutting fluid are surface finish, production and tool life. Here is where a cutting fluid pays for itself. Ask to have "the Man in the Barrel", your Stuart Representative, help select that Stuart Oil that will produce the very best results under the conditions you will subject it to.

Further information on sulphur staining is provided in the D. A. Stuart Shop Note Book, Bulletin S-1. Write for your copy.

D. A. STUART OIL COMPANY, LTD.
2727-49 S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Stuart Oils

Time Tested Cutting Fluids and Lubricants

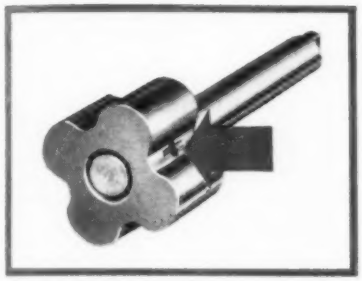
Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.

Shows the way to...

ASSEMBLE, DRILL, REAM, PIN and STAKE

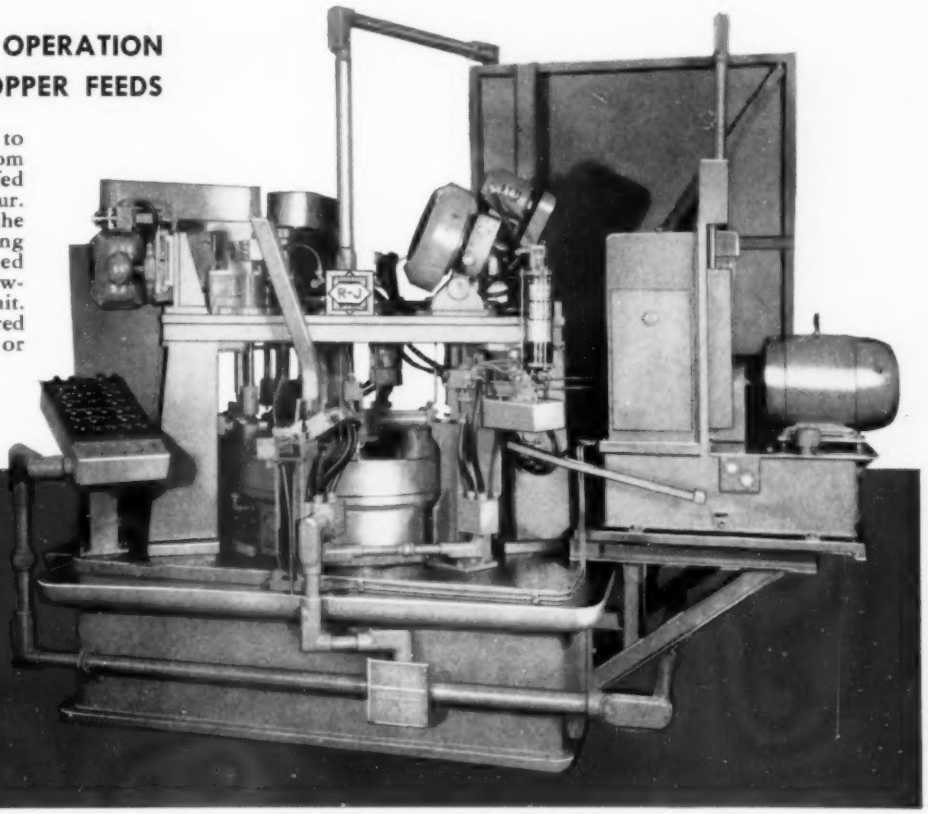
PUMP ROTOR and SHAFT



The machine shown below is an example of the *versatility* of Rehnberg-Jacobson design and manufacturing ability. The principal function of this machine is *automatic assembly* of several pieces, plus two simple machining operations that go with the job. The rotor and shaft are pressed together, a bottom hole is drilled in the assembly and then reamed and blown to remove chips, a pin is pressed in, a staking operation is performed, and a final shaving cut cleans the burrs off the staking. The machine is fully automatic, requiring only loading of parts into magazines and hopper. Production is conservatively rated at 150 assemblies per hour.

FULLY AUTOMATIC OPERATION
MAGAZINE and HOPPER FEEDS

The rotors and shafts feed to the first assembly station from gravity magazines. Pins are fed from a hopper at station four. Both assembly operations, the staking stroke, and the shaving operation are all performed by hydraulic cylinders powered by a self-contained unit. Completed pieces are delivered by a chute to a tote box or conveyor.



SELF-CONTAINED R-J UNITS USED

The drilling and reaming operations at stations two and three are performed by R-J No. 45 Drill Units with cam feed and special tooling. Fixtures are mounted on an R-J 8-station Automatic Index Unit.

Designers and Builders of Special Machinery

2135 KISHWAUKEE ST.

REHNBERG-JACOBSON MANUFACTURING COMPANY

ROCKFORD, ILLINOIS

MICROHONING* . . . FACTS YOU SHOULD KNOW

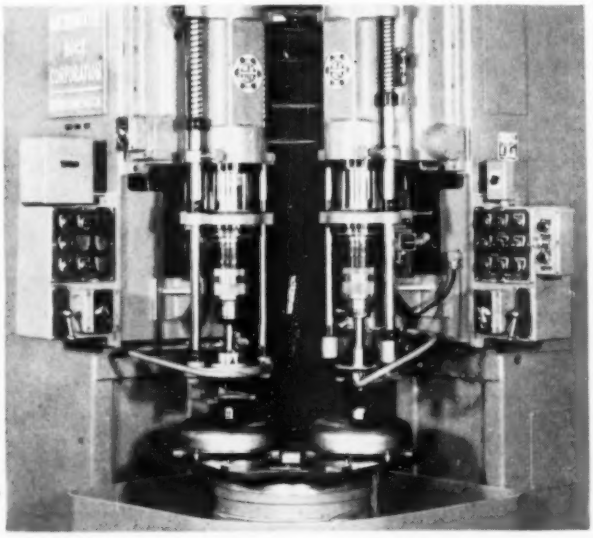
Compare These Microhoning Advantages

- Rapid and efficient stock removal.
- Dimensional accuracy obtained in every part.
- Macrogeometric accuracy—the Microhoning action is not affected by vibration; long abrasive stones generate a true surface.
- Microgeometric accuracy—any desired surface finish and cross-hatch angle duplicated in every part.
- No concentration of heat—the structural surface of the part is undamaged.
- Microhoning applications include tapers, spheres, splines, tandem or interrupted bores, flat surfaces, and any type of material, regardless of hardness (or softness).
- No practical limitation on part length and diameter.
- No chip removal problem—the minute Microhoning chips are flushed away in the coolant and automatically removed.
- Automatic size control.
- Readily adapted to automation.
- Eliminates tool dressing time and cost.
- Location of bores is undisturbed.
- Float principle and low speeds assure minimum maintenance.
- Backed by over 26 years of engineering and service experience.

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC
TRADE MARK

Microhoning is a low-velocity abrading process that employs thousands of small cutting tips. Because simultaneous and continuous cutting action of tips is spread over a wide area, stock is rapidly removed with a minimum of heating. This abrading technique generates functional surfaces ***by obtaining in one operation the required tolerances, specifications,*** or ***condition*** of the surface characteristics.

Included in these characteristics are: dimensional size (the distance between points or faces of a part, e.g., the diameter of a bore); macrogeometry (waves whose crests are more than 1/32" apart); microgeometry (roughness or scratches whose crests are less than 1/32" apart); and surface structure.



Microhoning . . . Example Application

Microhoning both I.D. and O.D. of the hub of a transmission torus cover to generate geometric accuracy and a surface finish of 10 microinches.

O.D.—*2.375", approx. 1" long, blind end*
I.D. —*2.125" x .280" long*
58-60 Rockwell "C"
Stock removal: *.001" to .002"*
Surface finish: *10 microinches*
Production: *180 per hour, gross.*

***MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish**

Movies describing various machining processes and the generation of functional surfaces are available for group meetings. For literature or further information on films, write to:

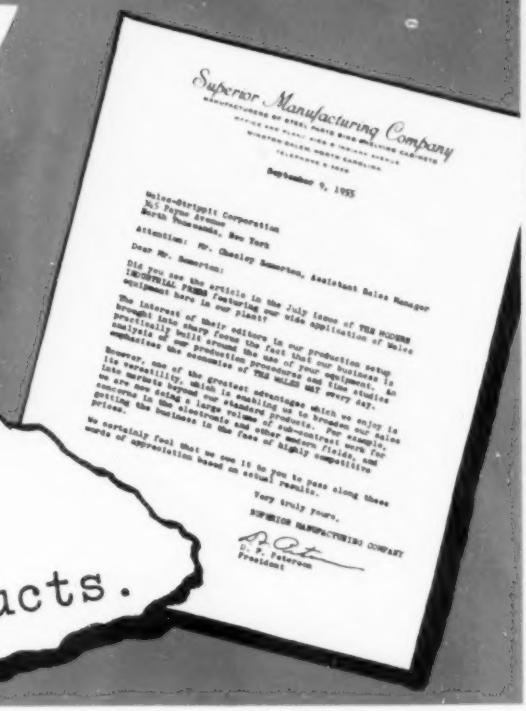
MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

VERSATILITY

The Wales Way

OF PUNCHING AND NOTCHING


Superior Manufacturing Company

September 9, 1955

Wales-Strippit Corporation
593 Payne Avenue
North Tonawanda, New York

Attention: Mr. Chesley Somerton, Assistant Sales Manager

Dear Mr. Somerton:

Did you see the article in the July issue of THE MODERN INDUSTRIAL PRESS featuring our wide application of Wales equipment here in our plant?

The interest of their editors in our production setup brought into sharp focus the fact that our business is specifically built around the use of your equipment. An analysis of our production procedures and time studies emphasizes the economies of THE WALES WAY every day.

However, one of the greatest advantages which we enjoy is its versatility, which has enabled us to broaden our sales into markets beyond our standard products. For example, we are now doing a large volume of sub-contract work for some of the electronic and other new fields, and getting the business in the face of highly competitive prices.

We certainly feel that we owe it to you to pass along these words of appreciation based on actual results.

Very truly yours,

SUPERIOR MANUFACTURING COMPANY

D. F. Peterson
President

"...enables us to broaden our sales into markets beyond our standard products."

"Our business is practically built around the use of Wales equipment", stated D. F. Peterson, President, in commenting on the many advantages which equal in importance the time and cost savings made possible by THE WALES WAY.

In addition to manufacturing steel cabinets, shelving and storage equipment, Superior has been able to tool up for and deliver contract work in volume and at competitive prices, thanks to the versatility of Wales punching and notching equipment.

Steel cabinets or shelving...television or what have you,—*you too* will discover pyramiding savings in lowered tooling cost, tool inventory, tool investment and cost per piece.

Wales Analysis Service Reveals Cost Reductions

Men alert to today's necessity for *doing something* about today's rising costs are invited to take advantage of Wales cost Reduction Analysis Service.

A nationwide group of Wales engineers is qualified to study your present methods as contrasted to THE WALES WAY. An appointment incurs no obligation, phone or write today.

WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

593 Payne Avenue, North Tonawanda, N. Y.

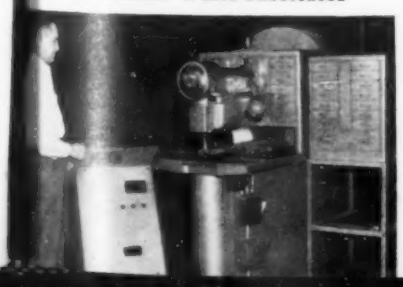
(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

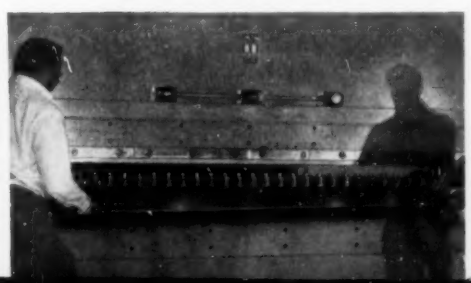
Wales Punching and Notching U do man-size job Superior Cabine

Contract work speeded up with versatile Wales Fabricator



THE WALES WAY punches 73 holes in shelving on high production basis.

Wales self-stripping hole punching uni punch 56 holes in two strokes.



MEDICINE MEN

can't solve hole problems but

MADISON

men can

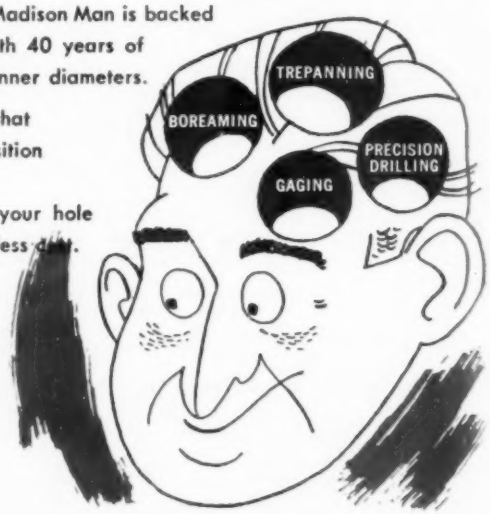
To phrase it simply — your Madison Man has the right medicine for your hole problems. And here's why . . .

As a Madison Sales Engineer he can expertly advise on every phase of hole-making relative to your current requirements, and with an understanding of the important operations surrounding them.

As a Madison Sales Representative his effectiveness is not channeled by selling just one or two methods of hole-making. He alone handles a complete line of Boring, Precision Drilling, Trepanning and Gaging Tools.

As a person to rely upon, your Madison Man is backed by a parent company with 40 years of specialized experience in producing inner diameters.

Therefore, it makes good sense that your Madison Man is in the strong position of being able to recommend to you on an honest and intelligent basis the correct tooling for your hole application that will do the job better, faster and at less cost.



MADISON MANUFACTURING COMPANY
Dept. TE, Muskegon, Michigan

Please send Madison literature on:

- ☐ Adjustable Boring and Reaming Tools
- ☐ Precision Drills
- ☐ Trepanning Tools
- ☐ Adjustable Boregages

NAME_____

FIRM_____

STREET_____

CITY_____ ZONE____ STATE_____

MADISON ADJUSTABLE REAMING TOOLS

MADISON MANUFACTURING CO. INDUSTRIES, INC.

DEPT. TE, MUSKEGON, MICHIGAN

"inner diameters are our business"

HIGH STANDARDS SET BY THIOKOL FOR...

IMPACT RESISTANT PLASTIC TOOLING

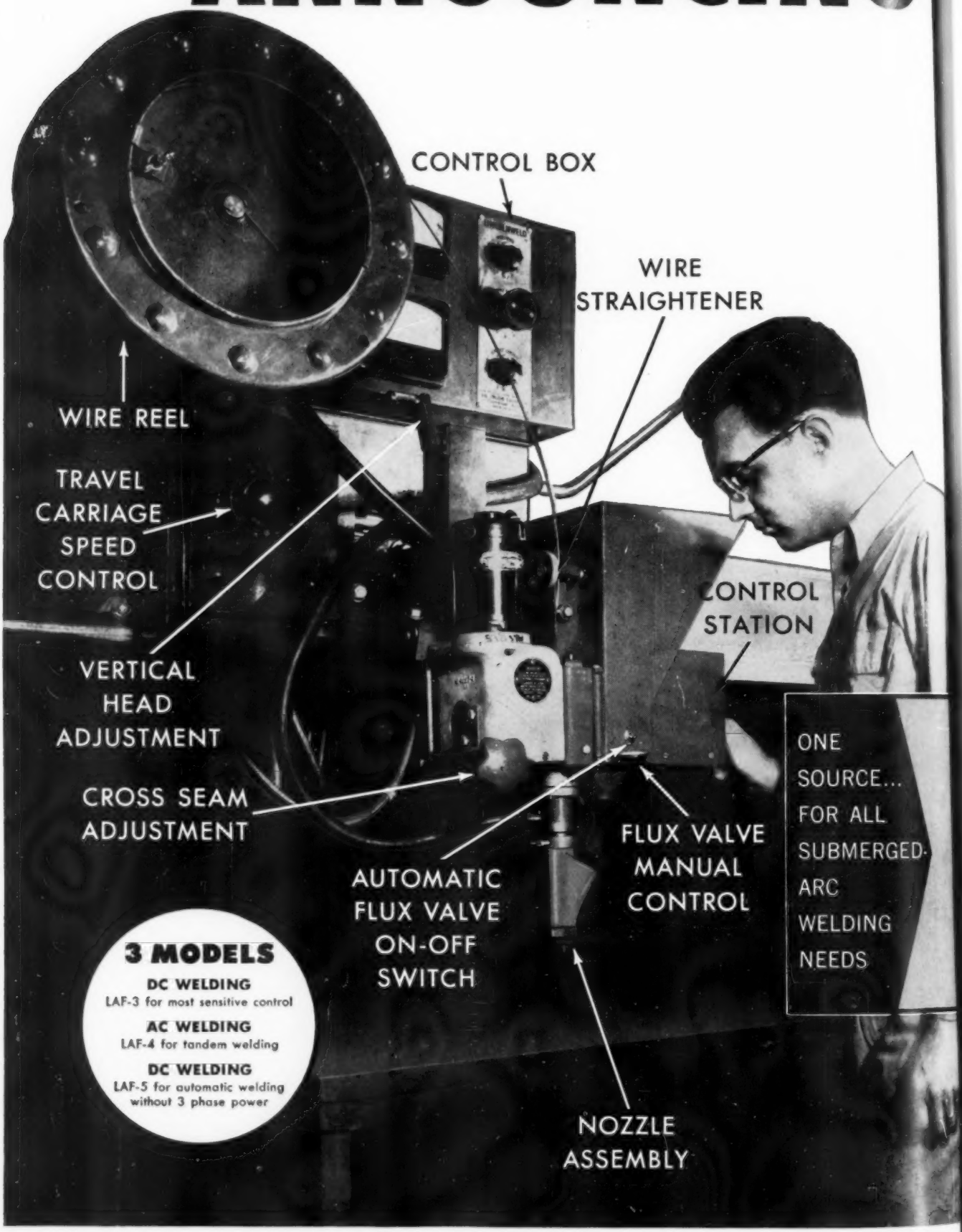
Resilient plastic tooling compounds based on combinations of THIOKOL Liquid Polymer with liquid epoxy resins are used for the toughest tooling jobs. Dies capped with these resilient plastic compounds absorb the terrific stresses of drop hammer forming without cracking or chipping . . . smoothing action of the compounds produces high-quality parts such as duct halves, beads, channels, and shallow pan sections in aluminum and steel with minimum wrinkling. Plastic tooling compounds containing THIOKOL Liquid Polymer packaged as liquids are easily worked and can be cold molded to exact finish contour with negligible shrinkage. They do not require heat for mixing or setting to tough, resilient plastics. Expensive hand grinding and scraping are eliminated. For full information write: THIOKOL CHEMICAL CORPORATION, 784 N. Clinton Ave., Trenton 7, New Jersey. IN CANADA: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario.

Thiokol Chemical Corporation manufactures Thiokol Liquid Polymer only as a raw material. We are happy to indicate sources of suitable compounds for end use.

Thiokol®

PIONEER MANUFACTURERS OF SYNTHETIC RUBBER

ANNOUNCING


CONTROL BOX
WIRE STRAIGHTENER
WIRE REEL
TRAVEL CARRIAGE SPEED CONTROL
CONTROL STATION
VERTICAL HEAD ADJUSTMENT
CROSS SEAM ADJUSTMENT
FLUX VALVE MANUAL CONTROL
AUTOMATIC FLUX VALVE ON-OFF SWITCH
NOZZLE ASSEMBLY
ONE SOURCE... FOR ALL SUBMERGED-ARC WELDING NEEDS
3 MODELS
DC WELDING
LAF-3 for most sensitive control
AC WELDING
LAF-4 for tandem welding
DC WELDING
LAF-5 for automatic welding without 3 phase power

A NEW LINE

of automatic WELDERS and POWER SOURCES for submerged-arc welding

LINCOLNWELD now gives you

- AC or DC welding current
- Motor-generator or rectifier for DC welding
- Variable voltage or constant potential generator

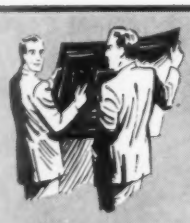
PLUS

Choice of Cold Starts or Hot Starts

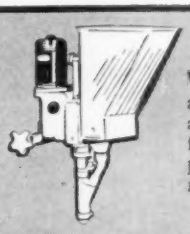
Choice of Stand-still Start or Flying Start

Variable inching speed to or away from work

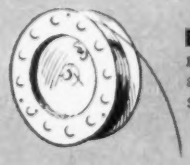
Automatic flux control



APPLICATION ENGINEERS in every principal area to recommend the right equipment for your application.

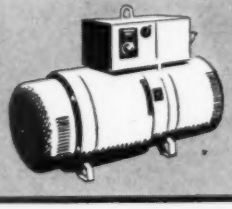


WELDERS automatic or semi-automatic, AC or DC, for low and high production, single or multi-head operation.



ELECTRODES mild steel, low alloy steel, stainless steel.

POWER SOURCES variable-voltage, constant potential or modified constant potential, DC or AC welding current.



FLUXES for lowest cost welding and hardsurfacing.

LOCAL REPAIR SERVICE Staffed by specialists. Immediate service on parts and repairs.

SEE IT DEMONSTRATED AT THE METAL SHOW

October 17-21... Lincoln Booth 231 in Philadelphia

Write for Bulletin 1355 giving complete facts.

THE LINCOLN ELECTRIC COMPANY

Dept. 5006 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

Set them, forget them—they stay tight
New high-torque Unbrako self-locking socket set screws

Research has proved that the tighter you seat a set screw the better it works. So we designed a set screw that can be tightened tighter than ever before. We formed a deeper socket. We put a radius in the socket corner. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. All this, plus the well-known self-locking knurled cup point that keeps it tight.

Let's see what the changes in the UNBRAKO socket mean to you. The deeper socket gives you more purchase with the wrench. Since more wrench can be put in the socket, you can tighten the screw much tighter. And you won't ream the socket or round the corners of the wrench. The radius in the UNBRAKO corners eliminates the sharp corners where cracks start. Ordinary socket screws have sharp corners which often crack even at torques much lower than those recommended for UNBRAKOS.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

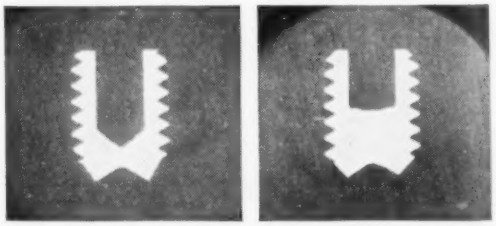
Up to 40% higher tightening torque—a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

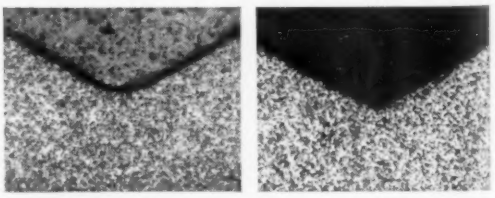
ALL UNBRAKOs can withstand higher tightening torques than ordinary socket set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary socket set screw.

Unbrako Set Screw **Ordinary Set Screw**



COMPARE the socket depth. The UNBRAKO socket at the left is much deeper than the socket in the ordinary set screw at the right. This additional depth in the UNBRAKO socket gives you more purchase with the wrench—you can set an UNBRAKO much tighter.

Unbrako Set Screw **Ordinary Set Screw**



THE RADIUS put in UNBRAKO socket corners eliminates the sharp corners where cracks start. They distribute the stresses developed when tightening torques are applied. You can seat an UNBRAKO tighter without screw failure. Ordinary set screws have sharp corners which often crack when tightened even at lower recommended torques.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

Electronic Favorites in the GAGE LABORATORY

These Sheffield electronic instruments are ideal for:

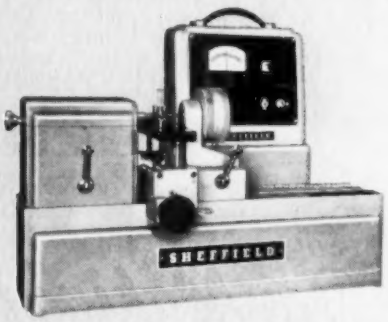
1. *Highly accurate measuring on surface plates*
2. *Checking masters and working gages*
3. *Setting snap and length gages*
4. *Checking precision tools and threads*

The particular electronic circuit in these instruments is exceptionally stable. Protection from disturbing line voltage fluctuations eliminates drift, prolongs vacuum tube life and permits continuous use without the inconvenience of resetting.

The indicating meters respond instantly but without overshooting, for quick, accurate readings. Remote gage head location precludes any thermal effects due to vacuum tube operation. *Fixed Gage and Inspection Room, Instrument Division, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.*

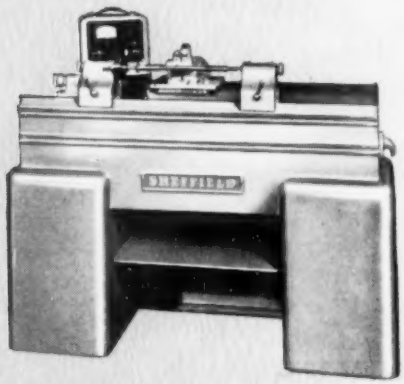
ELECTRONIC N-6 INTERNALCHEK: Choice of the world's finest laboratories; Amplifications, 1000/2000 Dual, 5000/10,000 Dual, 5000 Single; work part diameter, .240" to 12.000"; gaging depth, 1.5".

ELECTRONIC HEIGHT GAGE: First choice of the toolroom; Amplification 1000/2000 Dual; scale range, .003"; smallest graduation, .0001"; overall vertical range, 26".



NEW HORIZONTAL EXTERNALCHEK: Dual amplification, 1000/2000 to one; capacity 12"; vertical table travel 2½"; micrometer tailstock with 1" adjustment.

NEW ELECTRONIC COMPARATOR: Dual amplifications, 1000/2000 and 5000/10,000 to one; scale ranges .003", .0015", .0006" and .0003"; vertical capacity, 6"; anvil, 1¼" x 5".



UNMATCHED ELECTRONIC LEADCHEK: Dual amplification, 1000/2000 to one; scale range, .0015"; super-precision micrometer; work capacity 36" for length and 10" for diameter.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

MANUFACTURE AND MEASUREMENT FOR MANKIND

WRITE FOR SPECIFIC ENGINEERING DATA SHEETS ON ANY OR ALL OF THESE INSTRUMENTS

7147

A STURDY ALL-AROUND TOOL for PRODUCTION JOBS!

M-B

Model U-TR 60,000 RPM UTILITY Pneumatic GRINDER

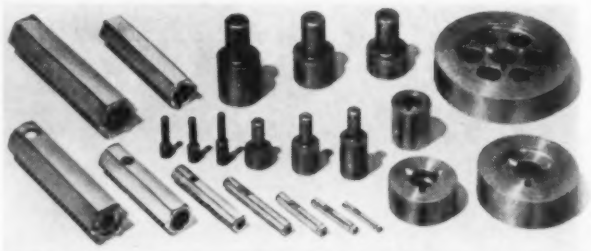
An outstanding, powerful, fast-cutting tool of proven high efficiency. Designed for the tough jobs and real production. Performs indefinitely and dependably. Precision made. Extra heavy spindle of special alloy steel. Grease-sealed bearings, no manual or automatic lubrication required. Steel housing for safety.

WRITE FOR LITERATURE

M-B PRODUCTS
46 VICTOR AVE., Div. 11
DETROIT 3, MICHIGAN

USE READER SERVICE CARD; INDICATE A-11-310-1

SAVE TIME and MONEY!



buy PLUG GAGE HANDLES AND BLANKS

(Made to the American Gage Design Standards)

MANUFACTURERS OF:
- TAPERLOCK HANDLES & BLANKS
- TRILOCK HANDLES & BLANKS
- REVERSIBLE PIN GAGE HANDLES, BLANKS & BUSHINGS
- PLAIN & THREAD RING GAGE BLANKS
- COMPLETE THREAD RING GAGE ASSEMBLIES
- THREAD RING HOLDERS
- MASTER SETTING DISK BLANKS & INSULATOR GRIPS
- BALL HANDLES

It is no longer economical to make your own gage handles and blanks. Let us prove to you how Huron can save both time and money. You too will join the majority of nationally important companies who are already buying gage supplies from Huron.

SAVE TIME . . . all American Gage Design Standard handles and blanks are in stock and available for immediate delivery from any of Huron's three offices. Blanks are stocked in approximate 1/16" steps for minimum grinding and lapping. All Taperlock Blanks are hardened to 62-64 Rockwell. This means a finished gage possibly days sooner!

SAVE MONEY . . . you can take advantage of Huron's mass-production to increase your "precision production time". It is because of this quantity production that Huron's prices are the lowest in the industry—yet the quality is unsurpassed.

Each Huron Gage Product is guaranteed to be of the highest quality material and workmanship.

WRITE TODAY FOR FREE PRICE LIST CATALOG.

HURON MACHINE PRODUCTS INC.

EAST COAST OFFICE	HOME OFFICE	WEST COAST OFFICE
274 Park Road	6250 Monroe	2809A Glen Oaks
W. Hartford, Conn.	Dearborn, Mich.	Burbank, Calif.

USE READER SERVICE CARD; INDICATE A-11-310-3

Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy

ADVANCE CROSS-SLIDE ROTARY TABLE

*Proved by actual on-the-job performance

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.

MORRISON ENGINEERING COMPANY

941 West Lake Street, Dept. B., Chicago 7, Illinois

USE READER SERVICE CARD; INDICATE A-11-310-2

CONCENTRIC LIVE CENTERS the original, patented spring loaded live centers

AUTOMATIC THRUST ADJUSTMENT
Spring loaded spindle maintains constant tail stock thrust.

LONGER LIFE
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

FASTER SPEEDS
Smaller turning radius gives much higher RPM rate than ordinary live centers.

GREATER LOAD CAPACITY

LESS OVERHANG MEANS MORE RIGIDITY . . MORE WORKING RANGE

JAM PROOF

Write today for complete information

Pat No. 2,620,473

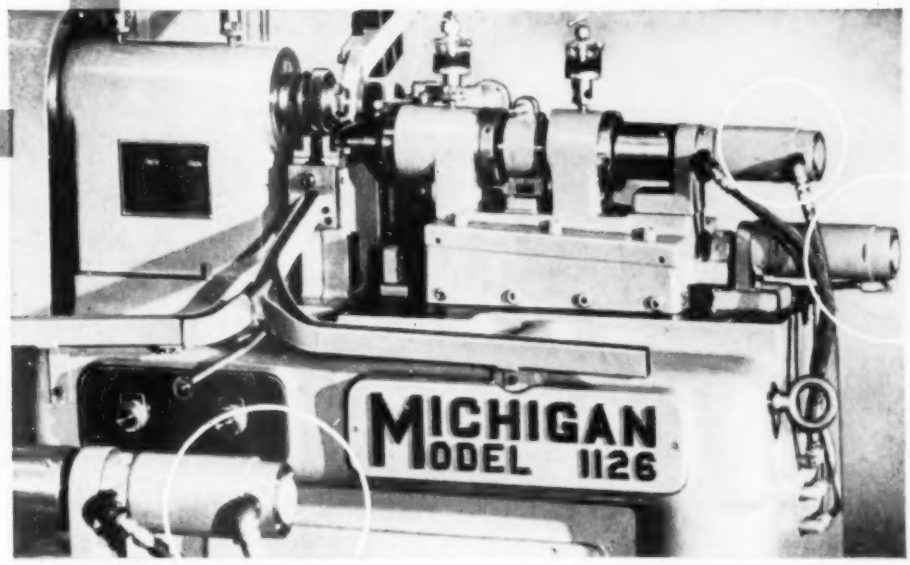
CONCENTRIC TOOL CORP., 2486 Huntington Dr. San Marino, Calif.

USE READER SERVICE CARD; INDICATE A-11-310-4

O-M

CYLINDERS
(air and hydraulic)

an important part of the automation picture at MICHIGAN TOOL COMPANY



O-M cylinders (shown here installed on an automated speeder) are an integral part of "Gear-O-Mation" at Michigan Tool Company. In their automatic gear production line, O-M cylinders provide the muscle in the movement or holding of parts.

Important factors in Michigan Tool's choice of O-M cylinders for these machines were: *COMPACTNESS OF DESIGN* – their cleaner, more streamlined construction that allows installation in less space; *LESS MAINTENANCE* – easier to clean, inspect, remove, dis-assemble and service, if necessary, with no special equipment or skills needed. Knocks out downtime, keeps loading equipment in continuous operation.

O-M air and hydraulic cylinders are available in complete range of sizes (1½ to 8" bores), with standard, 2 to 1 or oversize rods. All steel construction with bearing bronze. Completely interchangeable parts. Immediate delivery on many sizes.

Whatever your particular straight-line motion applications may be, an O-M Field Engineer will be happy to call and discuss them with you. Just mail coupon . . . no obligation, of course.

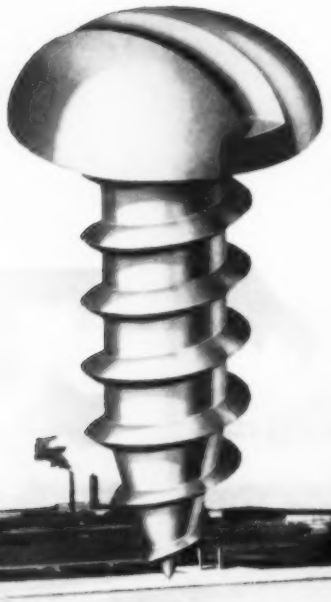
fit where others won't

mail coupon now!

for FREE catalog, showing all cylinders, mounts and mounting brackets.

ORTMAN-MILLER MACHINE COMPANY
13 143rd Street, Hammond, Indiana
☐ Have representative call ☐ Send latest catalog

Name_____ Position_____
Company_____
Address_____
City_____ Zone____ State_____



a new plant for PARKER-KALON

to keep P-K production and progress in pace with expanding needs for P-K Fasteners

In a few weeks, Parker-Kalon will move to its new plant in Clifton, New Jersey (about 10 miles from New York City). This modern building, containing 267,000 square feet on one floor, is one of the largest plants devoted exclusively to the manufacture of fasteners.

It is planned for the highest efficiency and economy in all operations, with production keyed to the steadily increasing demand for P-K Fasteners throughout industry. Advanced facilities for engineering and research will accelerate P-K progress in development of new and improved fasteners.

Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"

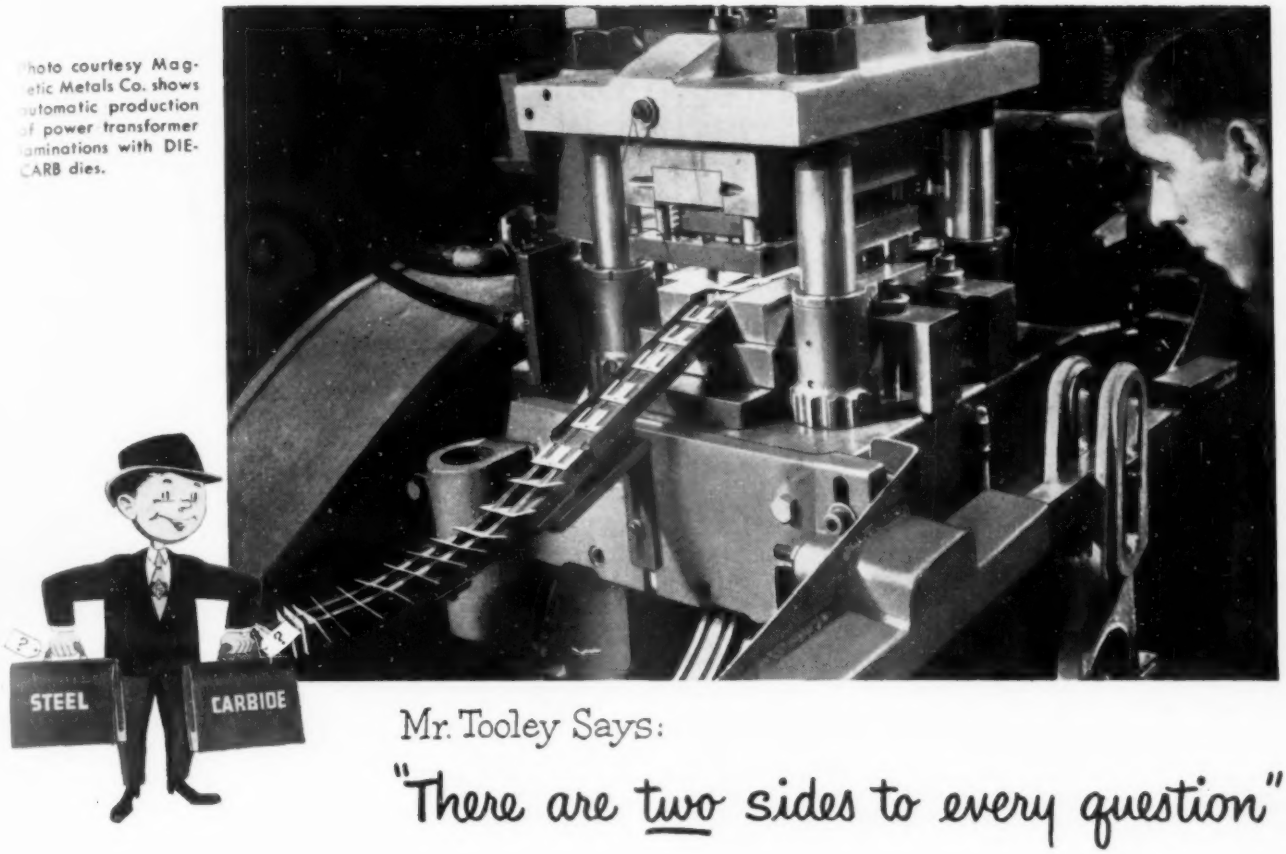
PARKER-KALON DIVISION
General American Transportation Corporation
Clifton, New Jersey.

PARKER-KALON®

SELF-TAPPING SCREWS — STAPS — SOCKET SCREWS — SCREWNAILS — MASONRY NAILS — WING NUTS — THUMB SCREWS

Sold through leading Industrial Distributors

Photo courtesy Magnetic Metals Co. shows automatic production of power transformer laminations with DIECARB dies.



Mr. Tooley Says:

"There are two sides to every question"

CROMOVAN

HIGH CARBON—
HIGH CHROME STEEL

- **Tougher edge**
- **Better edge wear**
- **Safe to heat treat**
- **Easier to machine**

DIECARB

THE HIGH PRODUCTION CARBIDE

- **Made expressly for blanking and lamination dies.**
- **High resistance to shock and abrasion.**
- **Low regrinding cost.**
- **Greater production per die life.**

The question of which die material to use for blanking and laminating operations involves a choice of either *steel* or *carbide*. Consideration must be given to the factors which determine die life, such as abrasiveness of the material to be worked, burr limit, distortion of product or elimination of subsequent machining operations.

In the selection and purchasing of die materials, Firth Sterling offers you *unique* advantages because it manufactures *both* steel and carbide. From *one* dependable source of supply you are assured of completely *un*biased recommendations and the *right* steel or carbide or *both* for every die making need.

Typically, Firth Sterling DIECARB and Firth Sterling CROMOVAN (die steel) are widely used for blanking and laminating operations, depending upon job requirements. Write today for literature and unbiased recommendations for your specific needs.

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MILLS: McKEESPORT, TRAFFORD, DETROIT, HOUSTON

OFFICES AND WAREHOUSES*: BIRMINGHAM CHICAGO* CLEVELAND DAYTON DETROIT* HARTFORD* HOUSTON LOS ANGELES* NEW YORK PHILADELPHIA PITTSBURGH WASHINGTON WESTFIELD, N.J.

R-310

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets
Zirconium

CALL YOUR FIRTH STERLING DISTRICT OFFICE OR DISTRIBUTOR. ASK MR. TOOLEY

Index of THE TOOL ENGINEER Advertisers

November 1955 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in ASTE Western Industrial Exposition

♦User of ASTE Data Sheets

A

Ace Drill Corp. ... 156
Acme Industrial Co. ... 200
Airborne Accessories Corp. ... 178
*Allegheny Ludlum Steel Corp. ... 276
American Brass Co., The ... 237
American Broach & Machine Co.,
Division of Sundstrand Machine Tool Co. ... 204
American Chain & Cable Co.,
Wilson Mechanical Instrument Division ... 159
♦*American Drill Bushing Co. ... 13
*American Society of Tool Engineers ... 280, 294
American Tool Works Co., The ... 2
*Ames, B. C., Co. ... 190
Ampco Metal, Inc. ... 16
Anderson, F. E., Oil Co., Inc. ... 165
Armstrong-Blum Mfg. Co. ... 176
Armstrong Bros. Mfg. Co. ... 155
Arter Grinding Machine Co. ... 205

B

Baird Machine Co. ... 39
Bakelite Co.,
A Division of Union Carbide & Carbon Corp. ... 15
Barber-Colman Co.,
Hendey Machine Division ... 234, 235
Barksdale Valves ... 188
Barnes Drill Co. ... 182
*Bath, John, Co., Inc. ... 257
Bay State Abrasive Products Co. ... 28-29
*Bellows Co., The ... 51
*Benco Collet Mfg. Co. ... 316
Bethlehem Steel Co. ... 49
Black Diamond Saw & Machine Works ... 258
Blake, Edward, Co. ... 177
Bodine Corp., The ... 275
Brookfield, Inc. ... 292
*Brown & Sharpe Mfg. Co. ... 68-69
*Brush Electronics Co. ... 251
*Buck Tool Co. ... 207
Buhr Machine Tool Co. ... 211
*Burg Tool Mfg. Co. ... 194
Butterfield Division,
Union Twist Drill Co. ... 67

C

*Carboloy,
Department of General Electric Co. ... 40-41
Card, S. W., Division,
Union Twist Drill Co. ... 269
Carlton Machine Tool Co., The ... 226-227
Cerro de Pasco Corp. ... 258
Cincinnati Milling Machine Co.,
Heald Machine Co., A Subsidiary ... Inside Front Cover
Cincinnati Shaper Co. ... 30-31
*Circular Tool Co., The ... 157
Clearing Machine Corp.,
Division of U. S. Industries, Inc. ... 72
Cleveland Crane & Engineering Co., The ... 238
Columbia Tool Steel Co. ... 207
Comtor Co. ... 232
Concentric Tool Corp. ... 310
Consolidated Machine Tool Corp. ... 61
Continental Tool Works Division,
Ex-Cell-O Corp. ... 249
Crane Packing Co. ... 265
Cross Co., The ... 74
Crucible Steel Company of America ... 218, 289
*Cushman Chuck Co. ... 267

D

*Danly Machine Specialties, Inc. ... 59, 282
*Davis Boring Tool Division,
Giddings & Lewis Machine Tool Co. ... 12
Deltronic Corp. ... 244
Denison Engineering Co., The ... 24
Detroit Power Screwdriver Co. ... 187
*Detroit Stamping Co. ... 274
DeVlieg Microbore Co. ... 12
*Dickerman, H. E., Mfg. Co. ... 58
*DoALL Co. ... 55-56-57-58
*Dow Chemical Co., The ... 98
Dykem Co., The ... 252

E

Eastman Kodak Co. ... 219
Eclipse Counterbore Co. ... 209
*Elox Corporation of Michigan ... 225
*Emhart Mfg. Co.,
V & O Press Division ... 38
Erickson Tool Co. ... 192
Ex-Cell-O Corp. ... Inside Back Cover
Ex-Cell-O Corp.,
Continental Tool Works Division ... 249

F

Fay, J. A., & Egan Co.,
Greaves Machine Tool Division ... 183
*Federal Products Corp. ... 52-53
Fellows Gear Shaper Co. ... 232
Firth-Sterling, Inc. ... 313
Foote-Burt Co., The ... 262
Frauenthal Division,
The Kaydon Engineering Corp. ... 242-243

G

Gaertner Scientific Corp. ... 152
Gammons-Hoaglund Co. ... 252
♦Gardner-Denver Corp.,
Keller Tool Division ... 220
♦Gatco Rotary Bushing Co. ... 266
*General Electric Co.,
Carboloy, Dept. of ... 40-41
*Giddings & Lewis Machine Tool Co.,
Davis Boring Tool Division ... 12
Gisholt Machine Co. ... 14, 48
Gorton, George, Machine Co. ... 44
Govro-Nelson Co. ... 244
Greaves Machine Tool Division,
J. A. Fay & Egan Co. ... 183
Greenfield Tap & Die Corp. ... 37
Greenlee Bros. & Co. ... 264

H

*Hammond Machinery Builders, Inc. ... 161
*Handy & Harman ... 201
Hannifin Corp. ... 297
*Hardinge Brothers, Inc. ... 5
Heald Machine Co., Subsidiary of
Cincinnati Milling Machine Co. ... Inside Front Cover
*Heller Machine Co. ... 214
Hendey Machine Division,
Barber-Colman Co. ... 234-235
Hill Acme Co., The ... 256
Houghton Laboratories, Inc. ... 169
Huron Machine Products ... 310

I

*Ideal Industries, Inc. ... 213
Ingersoll Milling Machine Co., The ... 239
Ingersoll-Rand, Inc. ... 272

J

*Jarvis Corp. ... 248
Johnson, Carlyle, Machine Co., The ... 261

K

Kaufman Mfg. Co. ... 252
*Kaydon Engineering Corp., The,
Frauenthal Division ... 242-243
Kearney & Trecker Corp. ... 283
♦Keller Tool Division,
Gardner-Denver ... 220
Kempsmith Machine Co. ... 245
*Kenco Mfg. Co. ... 282
Kennametal, Inc. ... 64, 230
Kling Bros. Engineering Works ... 148
Kurt Orban Co., Inc. ... 252

L

ndis Machine Co. 8-9
pointe Machine Tool Co., The 25
vallee & Ide, Inc. 173
e, K. O., Co. 232
es-Bradner Co. 271
pel High Frequency Laboratories 26
rvin, Louis, & Son, Inc. 216
incoln Electric Co. 306-307
incoln Gage Co. 167
incoln Park Industries, Inc. 206
indberg Engineering Co. 288
ipe-Rollway, Inc. 184
ittell, F. J., Machine Co. 156
odding, Inc. 160
ogan Engineering Co. 210
ovejoy Tool Co., Inc. 274
ufkin Rule Co., The 149

M

Macklin Co. 236
♦Madison Industries, Inc. 304
Mallory, P. R., & Co., Inc. 198
Manhattan Rubber Division,
Raybestos-Manhattan, Inc. 268
Matthews, Jas. H., & Co. 292
*M-B Products 310
*McDonough Mfg. Co. 274
Mechanite Metal Corp. 290-291
Metal Carbides Corp. 240
Meyers, W. F., Co. 232
Michigan Tool Co. 27
Micromatic Hone Corp. 302
*Modernair Corp. 232
Mohawk Tools, Inc. 175
Monarch Machine Tool Co. 286-287
Morrison Eng. Co. 310
Morse Twist Drill & Machine Co. 32-33
*Motch & Merryweather Machinery Co., The 21

N

National Broach & Machine Co. 259
♦National Twist Drill & Tool Co. 6-7
*Nelco Tool Co., Inc. 254
Niagara Machine & Tool Works 62-63
Noble & Westbrook Mfg. Co. 166
Norgren, C. A., Co. 191
Norton Co.,
Abrasive Grain Division 285
Abrasive Grinding Wheel Division 42-43
Machine Division 34-35

O

*Oakite Products, Inc. 195
Ohio Crankshaft Co., The 233
O. K. Tool Co., Inc., The 281
Orban, Kurt, Co., Inc. 252
♦Ortman-Miller Machine Co. 311
Osborn Mfg. Co., The 36

P

Parker-Kalon Corp. 312
Parker-Majestic, Inc. 277
Pines Engineering Co., Inc. 260
Pioneer Eng. & Mfg. Co. 186
*Pipe Machinery Co., The 54
Pope Machinery Corp. 11
Porter, H. K., Co.,
Vulcan Crucible Co., Division 153
Pratt & Whitney 202-203
*Precise Products Corp. 185
Producto Machine Co. The 270
Putnam Tool Co. 60

R

R and L Tools, Inc. 221
Raybestos-Manhattan, Inc.,
Manhattan Rubber Division 268
Reed Rolled Thread Die Co. 231
Rehnberg-Jacobson Co. 301
*Richards, J .A. Co. 252
Ring Punch & Die Co. 170
Rivett Lathe & Grinder Co., Inc. 241
Rotor Tool Co., The 197
Russell, Holbrook & Henderson, Inc. 253
Ruthman Machinery Co., The 186

S

*Sales Service Machine Tool Co. 164
Scherr, Geo., Co., Inc. 274
♦*Scully-Jones & Co. 46-47
*Seibert & Sons, Inc. 163
Seneca Falls Machine Co. 278
Sentry Co. 154
*Service Machine Co. 162
Severance Tool Industries, Inc. 244
*Sheffield Corp., The 309
Sheldon Machine Co. 208
Shell Oil Co. 228-229
*Simonds Abrasive Co. 223
*Simonds Saw & Steel Co. 293
Snyder Tool & Engineering Co. 17-18-19-20
South Bend Lathe Works 162
*Standard Gage Co., Inc. 4
*Standard Parts Co. 173
*Standard Pressed Steel Co. 308
Standard Tool Co. 263
*Starrett, L. S., Co., The 299
Steel Products Engineering Co. 189
Stone Machinery Co., Inc. 258
Stuart, D. A., Oil Co., Ltd. 300
Sturtevant, P. A., Co. 266
Sun Oil Co. 22-23
Sundstrand Machine Tool Co. 246-247
Sundstrand Machine Tool Co.,
American Broach & Machine Co., Division 204
*Super Tool Co. 45
Superior Steel Products Corp. 217
*Syntron Co. 185

T

Taft-Peirce Mfg. Co., The 295
Thiokol Chemical Corp. 305
Thompson Grinder Co. 65
Threadwell Tap & Die Co. 71
Timken Roller Bearing Co. 250
Titan Tool Co. 282
Torrington Co., The 66
*True-Trace Sales Corp. 216
Twentieth Century Mfg. Co. 178

U

Uddeholm Company of America, Inc. 10
Union Carbide & Carbon Corp.,
Bakelite Company, A Division 15
Union Twist Drill Co.,
Butterfield Division 67
S. W. Card Division 269
Union Division 215
U. S. Drill Head Co. 222
U. S. Industries, Inc.,
Clearing Machine Corp., Division 72
*United States Rubber Co. 224
*U. S. Tool Co., The 180
Universal Engineering Co. 70

V

*V & O Press Co., The
Division of Emhart Mfg. Co. 38
Vanadium-Alloys Steel Co. 255
*Vascoloy-Ramet Mfg. Corp. 146
Verson AllSteel Press Co. ..... Back Cover
*Vlier Eng. Co. 50
Vulcan Crucible Co., Division
H. K. Porter Co. 153
Vulcan Tool Co. 266

W

♦*Waldes Kohinoor, Inc. 179
*Wales-Strippit Corp. 303
Walker, O. S., Co., Inc. 168
Wesson Co. 159
*Whistler, S. B., & Sons, Inc. 196
Wiedemann Machine Co. 284
Wilson Mechanical Instrument Division,
American Chain & Cable Co. 159
Wilton Tool Co. 174
♦Winter Brothers,
Division of National Twist Drill & Tool Co. 6-7
Wood & Spencer Co., The 279
Woodworth, N. A., Co. 296

Z

Zagar Tool, Inc. 273
Ziegler, W. M., Tool Co. 216

THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

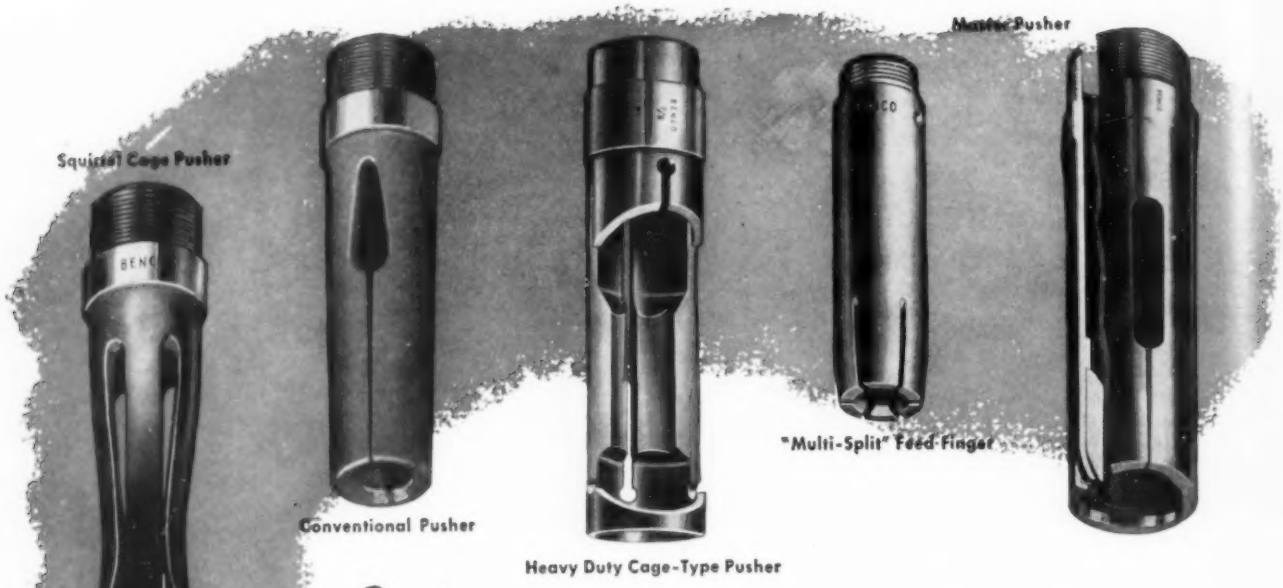
EASTERN
Austin G. Cragg
400 Madison Ave.
Phone: Plaza 9-4018
New York 17, N. Y.

OHIO
Richard E. Cleary
15515 Detroit Avenue
Phone: LAkewood 1-7125
Cleveland 7, Ohio

CENTRAL
Clarence T. Etter
R. Alan Cobleigh
10700 Puritan Avenue
Phone: University 4-7300
Detroit 38, Michigan

WESTERN
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

PACIFIC COAST
Robert E. Ahrensdorf
1140 Wilshire Blvd.
Phone: MAdison 9-2681
Los Angeles 17, Calif.



Get smoother, faster feeding with

BENCO PUSHERS

BENCO *products include*

- Solid Collets
- Master Collets and Pads
- Master Pushers and Pads
- Pushers and Feed Fingers
- Ejector Collets
- Collet Sleeves and Chuck Nuts for B. & S. Machines
- Carbide-faced Stock Stops for B. & S. Machines

You get the most out of your machines and reduce stock waste when you use Benco Pushers because they are designed and processed to insure smoother, faster feeding on simple or difficult jobs!

Expertly manufactured from selected alloy steels, properly heat-treated, carefully inspected for accuracy and tension, Benco Pushers out-produce and out-last similar products. As a result, extraordinary production records over a wide range of feeds and speeds are easily achieved on machines equipped with Benco Pushers.

Let us recommend the proper Benco Pushers for your particular requirements. You get immediate delivery on most sizes from our large stock.

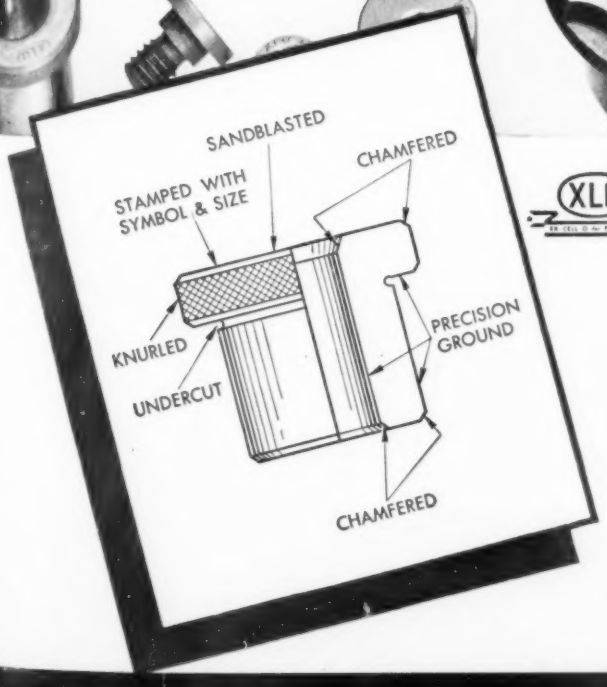
Benco COLLET MANUFACTURING CO.
Cleveland 14, Ohio

REPRESENTATIVES: Tornquist Machinery Company, Los Angeles, Calif.; Dorow Machine Tools, Wichita, Kan.; Harry Dunn Corp., Houston, Texas; J. K. Bousum Co., Detroit, Mich.; Walter J. Greenleaf Co., Pittsburgh and Erie, Pa.; Mason Machine Tool Co., Salt Lake City, Utah & Denver, Colo.; General Foundry & Machine Co., Sanford, N. C.; Frank M. Wilson, Buffalo, N. Y.; Hospelhorn Tool & Supply Co., Dayton, Ohio; Kel-Sir Company, Milwaukee, Wisc.; Fred J. McMillen, Providence, R. I.; Pearse-Dengel Tool Company, Hasbrouck Heights, N. J.; Philadelphia Tool Company, Bala-Cynwyd, Pa.; W. C. Straub, Cleveland, Ohio; G. W. Wittlinger, Chicago, Ill.; J. E. Dilworth Company, Memphis, Tenn.; H. M. Scherling, Minneapolis, Minn.; H. F. Soderling Co., Seattle, Wash.; Production Tools, Toronto, Canada.

Look for These Features in Drill Bushings

EX-CELL-O HAS THEM ALL

- **MATERIAL**—High chrome and carbon oil-hardening steel for maximum wear.
- **FINISH**—precision ground inside and out, and under the head for perfect bearing.
- **CONCENTRICITY**—assured by grinding on arbors after the holes are finished.
- **HARDNESS**—Deep-hardened to 62-64 Rockwell "C" in automatic equipment.
- **UNIFORMITY**—of material, dimensions, finish, and hardness assure accuracy, long life for both bushings and tools.
- **PROMPT DELIVERY**—from stocks of standard sizes in Detroit, New York, Los Angeles, and London, Canada.
- **PREFERRED**—largest bushing users in the country are Ex-Cell-O customers.



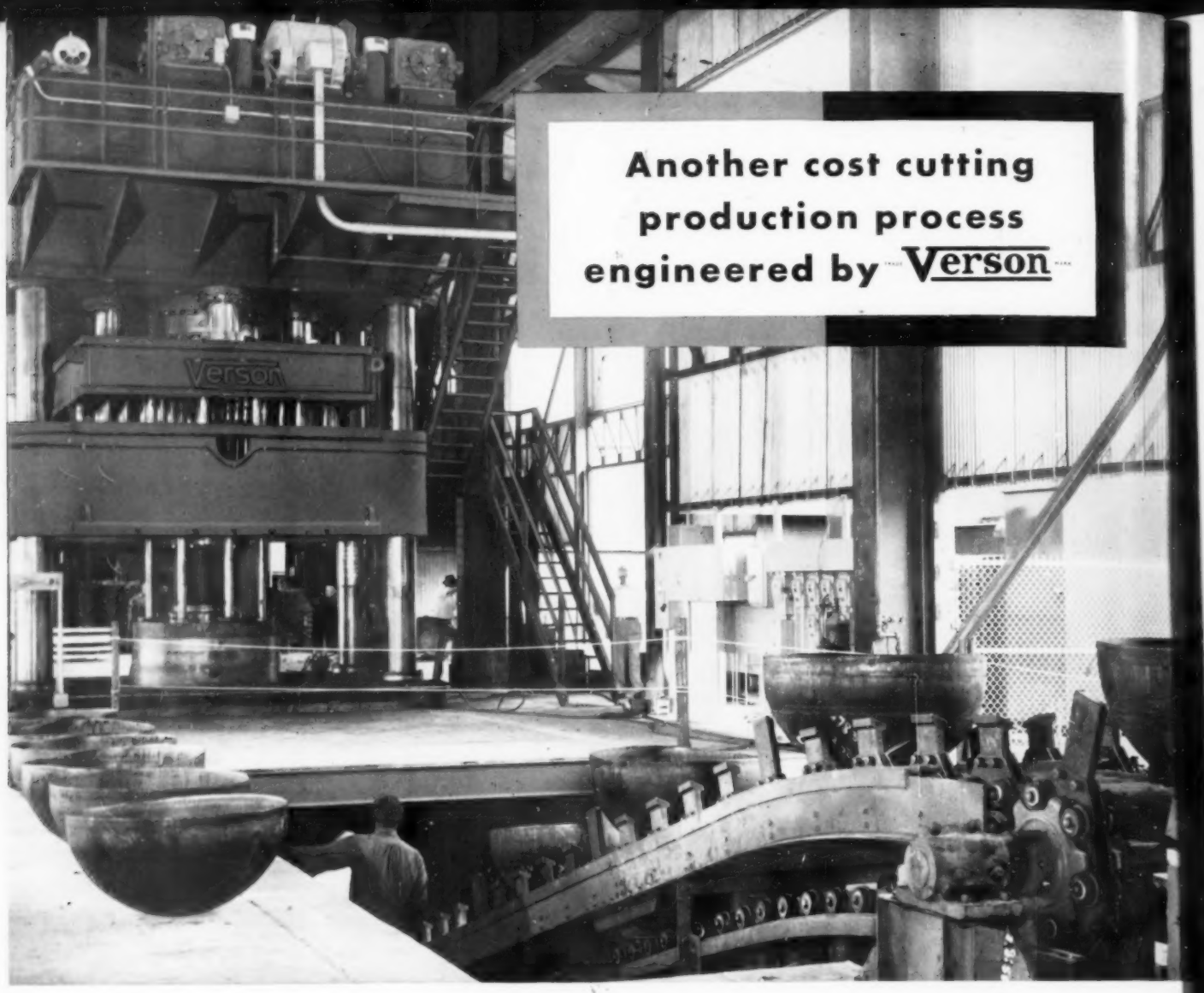
XLO

Your purchasing and engineering departments should have copies of this Ex-Cell-O Bushing Catalog No. 35936. Just ask for the number of copies you would like.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



Hot and Cold forming large diameter tank heads

In a unique process developed by Verson, this 3000 ton double platen, double action hydraulic press forms heads for pressure vessels in a single stroke. The heads are hemispherical and elliptical ranging from 40 inches to 10 feet in diameter and up to 3 feet deep.

Plate is fed to the press automatically. The head, regardless of size, is formed in a single press stroke. The completed head is pushed through a bed opening to a pneumatically operated elevator. The work is then transferred from the elevator to a conveyor and discharged. Tooling is supported in a manner that not only permits forming the wide range of sizes, but allows each size to be pushed through the bed opening.

Here is a good example of Verson's basic philosophy—*Anyone can build a press, Verson builds production processes.* If you have a problem involving the press forming of metals, this philosophy will pay you dividends. For recommendations, send an outline of your requirements.

Customized

INSTALLMENT AND LEASING PROGRAMS

For manufacturers who wish to pay for modernization out of the savings that Verson high-efficiency presses can effect, Verson offers installment and leasing programs tailored to your needs. For full details, send an outline of your requirements.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO

9336 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

s